SCIENTIFIC AMERICAN

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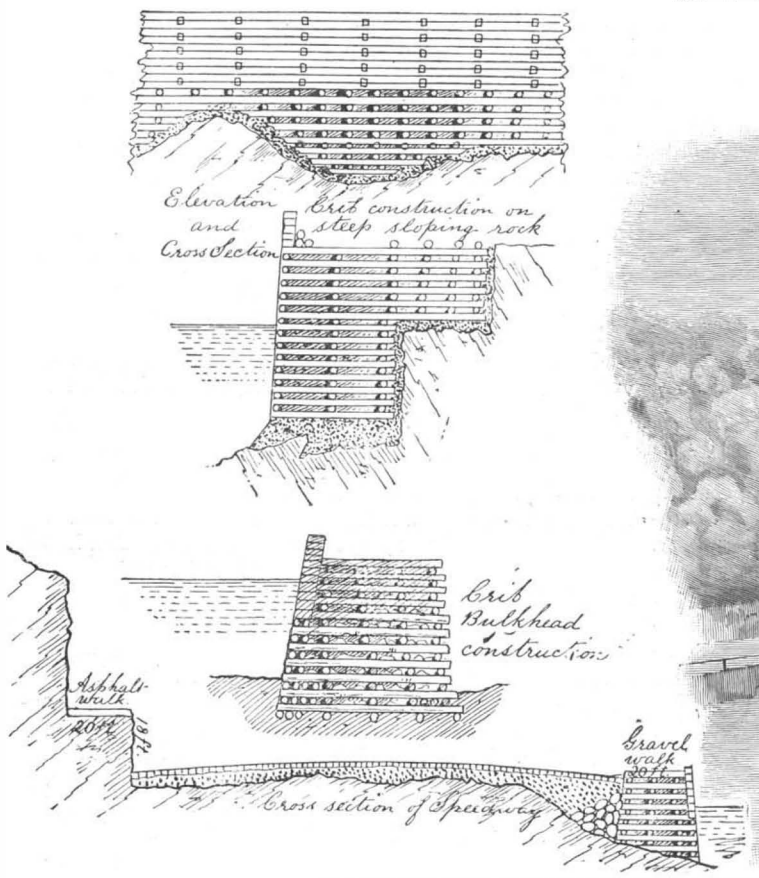
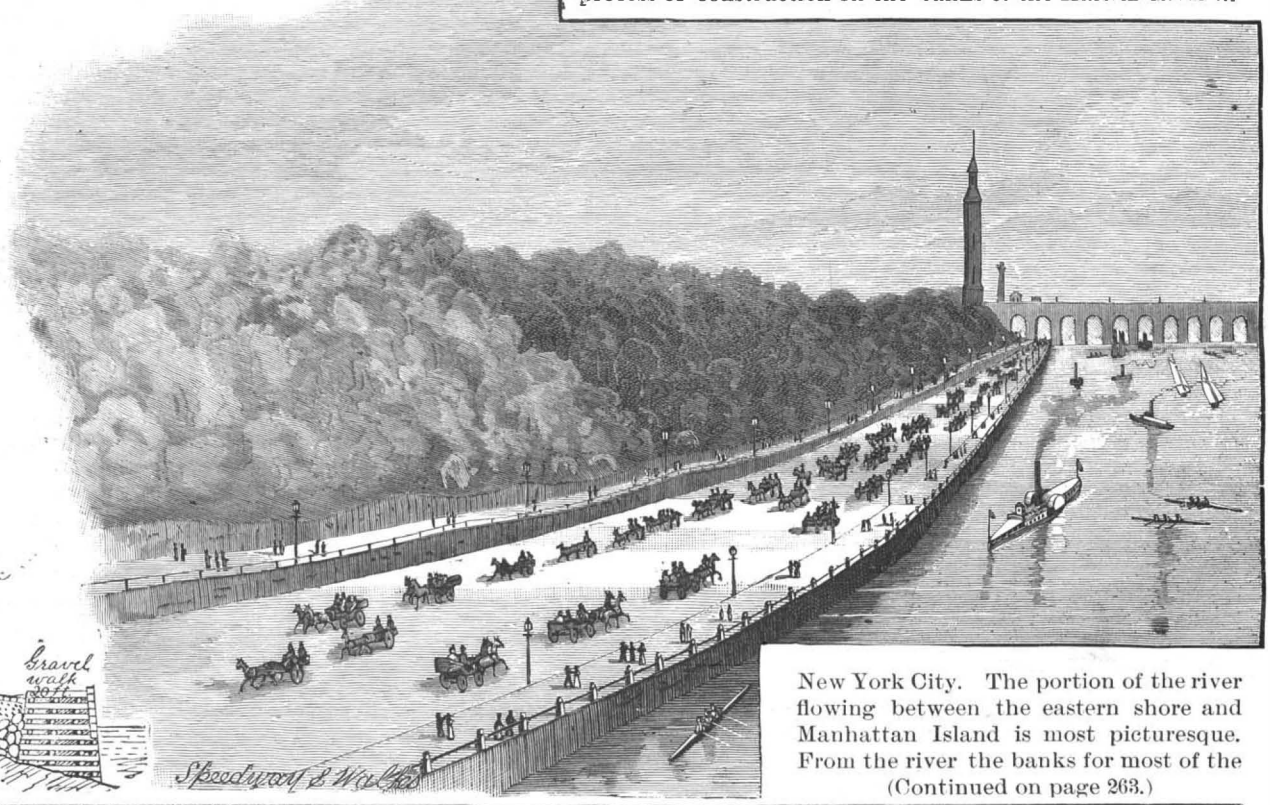
THE NEW HARLEM RIVER SPEEDWAY, NEW YORK.

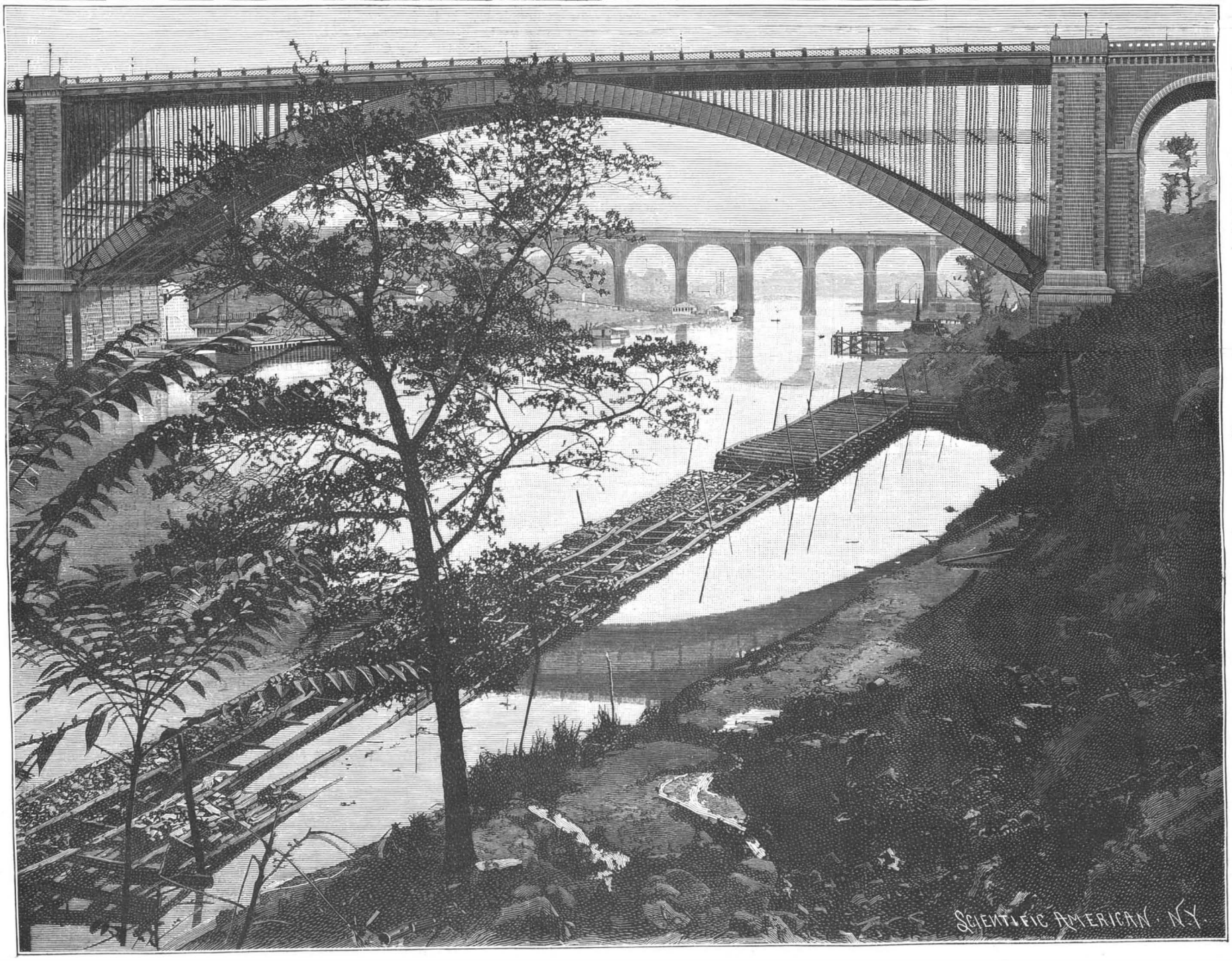
We have already described the new speedway which is in process of construction on the banks of the Harlem River in





New York City. The portion of the river flowing between the eastern shore and Manhattan Island is most picturesque. From the river the banks for most of the

(Continued on page 263.)



THE HARLEM RIVER SPEEDWAY IN NEW YORK CITY—VIEW UNDER WASHINGTON BRIDGE, LOOKING SOUTH.

Scientific American.

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NEW YORK, SATURDAY, OCTOBER 27, 1894.

Contents.

(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 992.

For the Week Ending October 27, 1894.

Price 10 cents. For sale by all newsdealers.

THE COMING TRANSIT OF MERCURY.

An interesting astronomical event will take place on the 10th of November next. We allude to the transit of the planet Mercury across the face of the sun. The phenomenon will be visible in North America, South America, Europe, and other quarters. It may be seen to advantage with the telescope.

A simple method whereby a number of persons may simultaneously observe the transit is to throw an enlarged image of the sun upon a sheet of white paper. This may be effected easily by using the telescope as a magic lantern in the manner illustrated in the engraving given on the next page.

A stick is tied to the end of the telescope; at the lower end of the stick is secured a block of wood in which a saw cut is made to receive the paper—stiff cardboard is the best. The paper sheet receives upon its surface the enlarged image of the sun, across which the shadow of the planet, in the form of a round black dot, will be seen to travel, at the rate of about one hundred thousand miles per hour. We advise our readers, especially the young people, to get out their telescopes and observe this most interesting phenomenon.

The coming transit will be visible from about 10 A. M. to 3 P. M. It will take the planet about 6¾ hours to move across the sun's disk.

The path of the transit is a little above the sun's center. The diameter of the sun's disk is estimated at 860,000 miles.

Of the family of planets visible to the naked eye, Mercury is the smallest and the nearest to the sun. His diameter is, in round numbers, 3,000 miles, and his distance from the sun thirty-five million seven hundred and fifty thousand miles (35,750,000). By reason of his nearness to the sun the planet escapes the observation of the majority of people. He is usually to be seen near the horizon, within a short time of sunrise or sunset. There is a lack of knowledge concerning the revolutions of Mercury; Schiaparelli concluded that Mercury revolves on his axis in the same time that he makes a revolution in his orbit; if so, he keeps the same side turned toward the sun; one side of the planet being always illuminated and intensely heated, the other side, more especially its central zone, being in constant darkness.

Whether Mercury carries an atmosphere is as yet not certainly determined. Some observers have, as they believe, seen evidences of an atmosphere. It is quite probable the question will be definitely settled by observations made with great telescopes during the coming transit.

The celebrated astronomer Leverrier made calculations in 1859 which accounted for certain anomalies in the movements of Mercury on the basis of the existence of another planet of about the same size as Mercury, and from it not far distant. Many searches have been made since Leverrier's announcement for this as yet unseen body, but so far without actual success, although some of the observers have claimed positively to have seen it.

Visibility of Torpedo Boats.

Some interesting experiments as to the visibility and audibility of torpedo boats at night have been made off Newport by the torpedo boat Cushing. The Cushing had been repainted with a color supposed to be least conspicuous. In the first experiment the Cushing steamed out from shore at night, having a powerful search light from the land directed upon her. At a distance of a thousand yards she passed out of sight of those on shore, and this, although it was light enough on the Cushing herself to read. For the second experiment, which was to determine the distance at which the boat could be detected by the noise of her engines and swash of water from the propellers, the night was very favorable, except for moonlight. The first thing observed was sparks from the funnel, and shortly afterward the swash of water was heard. The search light was then used, but it was several seconds before the boat was sighted, being then at a distance of 800 yards. The report upon the experiments observes: "Eight hundred yards is the maximum torpedo range, and a speedy craft would make great progress inside of this before guns could be trained upon her; so it is still questionable whether the search light is much of a safeguard against an attack from torpedo boats."

The Rapid Fire Gun Tests.

In our issue of June 30, 1894, we illustrated and described the test of rapid fire guns which was then being conducted at Sandy Hook. The Army Ordnance Board has now completed the test of these guns. The competing guns were the Driggs-Schroeder, Hotchkiss, Seabury, Maxim-Nordenfelt and Sponzel. All of the guns passed the test without material injury except the Sponzel gun. The honors were about equally divided between the Driggs-Schroeder and Hotchkiss guns. The heating of the guns after the firing of a number of rounds was considerable. After seventy-five rounds one of the guns melted soft solder placed on the chase. Another gun softened lead, indicating about 600 degrees F.

Genius and Degeneration.

It is a strange fact, however, and one not noticed by Lombroso or any other writer, as far as I know, that mechanical geniuses, or those who, for the most part, deal with material fact, do not, as a rule, show any signs of degeneration. I have only to instance Darwin, Galileo, Edison, Watts, Rumsey, Howe and Morse to prove the truth of this assertion. It is only the genius of æstheticism, the genius of emotions, that is generally accompanied by unmistakable signs of degeneration. Swinburne's poems show clearly the mental bias of their author, who is described as being peculiar and eccentric. Many of the men of genius who have assisted in making the history of the world have been the victims of epilepsy. Julius Cæsar, military leader, statesman, politician and author, was an epileptic. Twice, on the field of battle, he was striken down by this disorder. On on one occasion, while seated at the tribune, he was unable to rise when the senators, consuls and prætors paid him a visit of ceremony and honor. They were offended at his seeming lack of respect, and retired showing signs of anger. Cæsar returned home, stripped off his clothes and offered his throat to be cut by any one. He then explained his conduct to the senate, saying that he was the victim of a malady which, at times, rendered him incapable of standing.

Many men of genius have suffered from spasmodic and choreic movements, notably Lenau, Montesquieu, Buffon, Dr. Johnson, Santeuil, Crebillon, Lombardini, Thomas Campbell, Carducci, Napoleon and Socrates. Suicide, essentially a symptom of mental disorder, has hurried many a man of genius out into the unknown. The list begins with such eminent men as Zeno, Cleanthes, Dionysius, Lucan and Stilpo, and contains the names of such immortals as Chatterton, Blount, Haydon, Clive and David. Alcoholism and morphinism, or an uncontrollable desire for alcohol or opium in some form or other, are now recognized as evidences of degeneration. Men of genius, both in the old world and in the new, have shown this form of degeneration. Among the men and women of genius of the old world who abused the use of alcohol and opium were Coleridge, James Thomson, Carew, Sheridan, Steele, Addison, Hoffman, Charles Lamb; Madame de Stael, Burns, Savage, Alfred de Musset, Kleist, Caracci, Jan Steen, Moriand Turner (the painter), Gerard de Nerval, Hartley Coleridge, Dussek, Handel, Gluck, Praga, Rovani and the poet Somerville. This list is by no means complete, as the well-informed reader may see at a glance, yet it serves to show, however, how very often this form of degeneration makes its appearance in men of genius. In men of genius the moral sense is sometimes obtunded, if not altogether absent. Sallust, Seneca and Bacon were suspected felons. Rousseau, Byron, Foscolo and Caresa were grossly immoral, while Casanova, the gifted mathematician, was a common swindler. Murat, Rousseau, Wagner, Clement, Diderot and Praga were sexual perverts. Genius, like insanity, lives in a world of its own, hence we find few, if any, evidences of human affection in men of genius.

Dr. Johnson, who was a sufferer from folie du doute, had to touch every post he passed. If he missed one, he had to retrace his steps and touch it. Again if he started out of a door on the wrong foot, he would return and make another attempt, starting out on the foot which he considered the correct one to use. Napoleon counted and added up the rows of windows in every street through which he passed. A celebrated statesman, who is a personal friend of the writer, can never bear to place his feet on a crack in the pavement or floor. When walking, he will carefully step over and beyond all cracks or crevices. This idiosyncrasy annoys him greatly, but the impulse is imperative, and he cannot resist it. Those who have been intimately associated with men of genius have notice that they are very frequently amnesic or "absent-minded." Newton once tried to stuff his niece's finger into the bowl of his pipe, and Rovelle would lecture on some subject for hours at a time, and then conclude by saying, "But this is one of my arcana which I tell to no one." One of his students would then whisper what he had just said into his ear, and Rovelle would believe that his pupil "had discovered the arcanum by his own sagacity, and would beg him not to divulge what he himself had just told to two hundred persons."

We must not confound genius and talent—the two are widely different. Genius is essentially original and spontaneous, while talent is to some extent acquired. Genius is an abnormality, but one for which the world should be devoutly grateful. Psychos, in the case of genius, is not uniformly developed, one part, being more favored than the others, absorbs and uses more than its share of that element, whatsoever it be, which goes to make up intellectuality, hence less favored or less acquisitive parts show degeneration. Why genius should exist is one of the unexplained phenomena of nature, but that it is the result of natural causes I have not the slightest doubt.—Med. Rec.

Gas Headlights.

According to the Railway Review, in Europe and South America, principally on the German and Brazilian railroads, Pintsch gas has long and successfully been used in lomotive headlights in place of oil. Over 2,300 locomotives have been equipped in Germany alone, and in South America the Central Railroad of Brazil uses the gas headlights almost exclusively. Twenty five of the suburban locomotives which the Brooks Locomotive Works have nearly completed for this railroad are equipped with Pintsch gas signal and headlights of an improved pattern. On each of the locomotives, which are double ender, are two 20 inch gas headlights, fitted with powerful Argand burners, and four 14 inch gas signal lights, two on the forward bumper block and two on the rear end of the tender. In the cab is a small Pintsch lamp, the light from which is permitted to shine only on the faces of the gauges through a slot in the metal covered globe. The supply of Pintsch gas is carried in a tank suspended below the cab floor between the side frames of the tender. The system of piping is very complete, and the controlling cocks are so arranged with by-passes that the supply of gas to the lights at either end of the locomotive is easily and quickly adjusted.

It is the opinion of a number of locomotive engineers and other practical railroad men witnessing tests of a new improved Pintsch gas headlight recently made in the Delaware, Lackawanna & Western yards at Hoboken, N. J., that the light furnished is at least three times as powerful as that of oil headlights, while at the same time it met the very important requirement of not in any way obscuring the signal and other lights around the yard. This is one of the principal objections to the use of electric headlights, and one which the Pintsch gas headlights seem to have entirely overcome.

Trial of the Battle Ship Maine.

The official trial of the battle ship Maine took place in Long Island Sound October 17. The Maine is what is known as a composite built ship, that is hull constructed at a navy yard by the government and machinery furnished by contractors. The run was made in a stiff westerly wind. During the four hours' run under forced draught the general average of the steam pressure was 141 pounds, the propellers making 127 revolutions a minute. The average speed was 15·95 knots per hour. To this a tidal allowance of 1¼ knots must be made, so that the total speed was 17·2 knots or possibly 17·25 knots. The engines, which were built by the Quintard Iron Works, made from 400 to 600 horse power more than the 9,000 called for by the contract, so that a handsome premium may be expected. The temperature in the boiler and engine rooms was very high. In the engine room at the cylinders the thermometers registered at times 180 degrees, in the boiler room the temperature varied from 110 to 115 degrees. The Maine is the first completed battle ship of the new navy. She was launched November 18, 1890. She is 324 feet 4½ inches long, has 57 feet beam and 21 feet 6 inches draught. Her displacement is 6,682 tons. She carries 12-inch armor and will mount four 10-inch guns, with a range of 9 miles, and six 6-inch rifles. She has a fine supplementary battery. The ship has twin screws, each 15 feet in diameter. She can carry 822 tons of coal, and with that amount can steam 4,250 miles at a 10 knot speed.

We have published illustrated articles on the Maine in the issues of the SCIENTIFIC AMERICAN for November 29, 1890, and September 29, 1894.

The Chinese Names of the Treaty Powers.

The Chinese, when they first knew their eastern neighbors who are now exhibiting such a restless war spirit, named them Wa people. In their histories this single word was sufficient. By change of vowel during two thousand years Wa has become Wo. In the imperial declaration of war of August 1 this is the term used, and it is brief and sufficient. The Chinese like monosyllabic names for countries. The various foreign nations have, when making treaties, usually chosen the monosyllables which form their names. England, Ying kwo, means "the flourishing country," for ying, the treaty character for Great Britain, has that sense. Fa means law, and France, Fa kwo, is the "law abiding country." Germany, known as Te kwo, is the "virtuous country." The United States republic is the Mei kwo, or "beautiful country." Italy is the "country of justice," I kwo. Each treaty nation has chosen its own name for moral effect. It has been a matter for international diplomacy, and the Chinese government has invariably given way to the wishes of each of the treaty powers as represented by its minister and his Chinese secretary. From the time that the ministers of the treaty nations had residences in Pekin the name of the country made use of in diplomatic correspondence has been, of course, that which was satisfactory to the treaty powers. The same was the case with Japan. Japan, there can be no doubt, prefers Ji pen, the Land of the Rising Sun, because it is more poetical than the name Wo, which means "submissive," "winding and twisting." On the whole Japan wishes to be known as the land of the sun, Ji kwo, but she also likes Ji pen, which is the same as Japan, and she has not made the use of the term Wo a matter of complaint.—North China Herald.

The Street Railway Journal.

Our enterprising contemporary the Street Railway Journal has lately issued a splendid example of artistic typography in the shape of a souvenir number, published in honor of its tenth anniversary, and of the Atlanta meeting of the American Street Railway Association. This superb issue contains a 16 page article on Atlanta, a 10 page article on the association, a 30 page article on the street railway systems of the Southern cities, and a 20 page article on the history of street railway industry. All of these are handsomely illustrated—containing over 400 illustrations, among which are more than 125 portraits of street railway men. The whole forms a body of rare and useful information, indicative of the substantial character of trade journalism.

Atmospheric Resistances of Balls.

At a recent meeting of the Engineers' Club, Philadelphia, Pa., Professor Walter L. Webb read a series of notes on the results of some experiments to determine the resistance of the atmosphere to the free fall of spheres, which he had made when an instructor at Cornell University. The very thorough series of experiments that was contemplated was never completed, but the results that were obtained evidenced such a degree of accuracy that the author believes a description of the methods used and of the conclusions that can be drawn from the results will be of value to those interested and may lead to a continuation of the investigation.

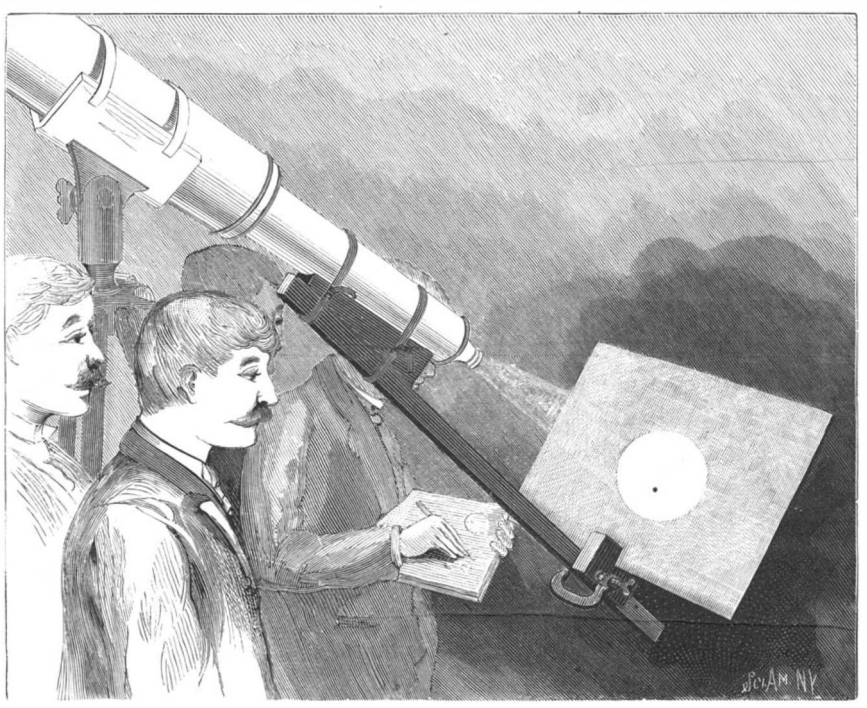
The apparatus was described in detail, and the calculations from the data obtained were written out in full on the blackboard. The results obtained from six sets of experiments were also tabulated in a chart which was exhibited.

The balls that were compared were of iron and wood, both finished by careful grinding to exact sphericity and diameters to within one one-thousandth of an inch. The volumes of air displaced and the shapes of the resisting surface were, therefore, identical for both balls. The grinding of the balls polished the surface of each of them and the skin friction was, therefore, practically the same in both cases. The heights dropped through were exactly the same, but the results show a much larger coefficient of resistance for the iron ball and a material increase in the coefficient for both balls in case of a short fall than with a longer one.

Conclusions were deduced from these experiments for the relations between mass, acceleration, resistance, etc., and the results showed that atmospheric resistance does not vary as the square of the velocity.

Aluminum Paper.

The surface of the paper is coated with adhesive matter, and the latter covered with laminated or powdered aluminum, or powdered aluminum is mixed with adhesive matter and spread on the surface of the paper by brushes or any other manner convenient.



HOW TO VIEW THE TRANSIT OF MERCURY.

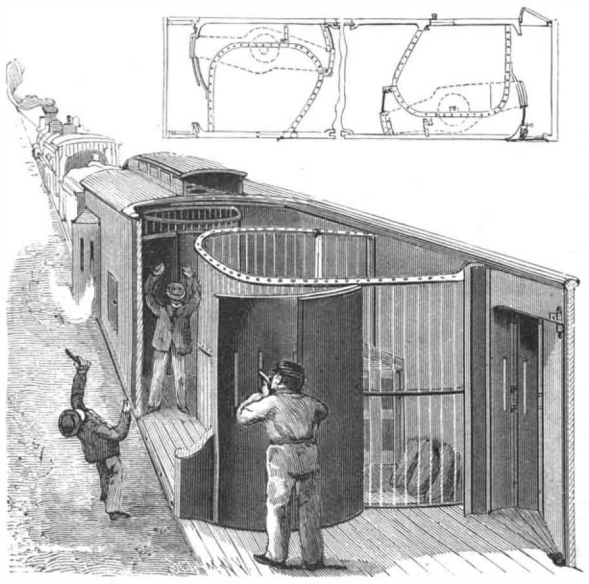
Attar of Roses.

Le Genie Civil gives an interesting account summarized in the American Architect of the manufacture of attar of roses, which, since the emancipation of the Balkan Provinces, has become a great industry in Bulgaria, and has been taken up on a large scale in Germany. We have all been accustomed to connect the fabrication of attar of roses with Persia and Syria, and, even now, India and Constantinople furnish probably the largest markets for it; but, although the art of making it was discovered in Persia, the manufacture has now nearly or quite died out, and the center of the business is now the country about Kazanlik, on the south slope of the Balkans, close to the Shipka, or Wild Rose Pass, famous in the history of the Russo-Turkish war. The rose-growing belt is situated at an average altitude of a thousand feet above the sea, and extends to a length of about seventy miles, with an average breadth of ten miles. On this ground are produced annually from five to six thousand million rose blossoms. The number of varieties cultivated is very small. Ninety per cent of all the blossoms are taken from a bushy variety of the Rosa Damascena, or damask rose, known to our gardeners mainly as the ancestor from which the infinite variety of hybrid perpetual roses derive a large part of their blood. Of the remaining ten per cent, a part are gathered from the white musk rose, which is frequently planted as a hedge around the fields of pink Damascena; while the rest are furnished by a dark-red variety of Damascena. Other sorts of roses have been tried, but some yield no attar at all and others give an essence having the perfume of violets, or pineapples, or hyacinth, rather than of roses; so that the growers have returned to the original kind.

In order to obtain the precious perfume in the largest quantity, and in its best condition, the flowers must be cut while the dew is still on them, and every morning, during the season of bloom, which lasts from about May 20 to June 20, troops of boys and girls climb the mountain slopes, long before sunrise, to gather the freshly opened flowers. The blossoms are thrown into baskets, and taken immediately to the distillery, it being important to finish the operation on the day that the flowers are gathered. As the baskets are received their contents are piled in cool, dark storerooms, from which they are taken for distillation. The stills are of the simplest construction, of tinned copper, each of about the capacity of a barrel. About twenty-five pounds of roses are put in each still, which is then filled about three-quarters full of water. The top of the still is put on, and the fire lighted. The worm is cooled with running water, and in about forty-five minutes, when about one-fifth of the contents of the still has been drawn over, the distillation is stopped, the still emptied, and the process repeated with a fresh charge, until all the morning's crop of roses has been treated. The product of this first distillation is rosewater, exactly like that which our grandmothers manufactured in the same way. To separate the attar, a second distillation is necessary. The rosewater is put again into the stills, and about one-third its bulk of what is called "second rosewater" is drawn over. This is now a highly perfumed liquid, turbid with suspended globules of an oily substance, which is the precious attar. To allow the attar to separate, the distillate is put into bottles with long necks, which gradually become filled with the oily essence. When the separation is complete, the attar is removed with a spoon, which has a small hole in the bowl. The water runs off through this hole, leaving the oil, which is put into the well-known ornamental bottles for sale. The attar sells for about six dollars an ounce, so that the industry is remunerative, although sixty thousand roses are required to make an ounce of attar. It is curious that the Bulgarian roses, although the mountain frosts make the crop a rather precarious one, produce much more essence than do the same roses elsewhere. After the war of 1878, the Turkish government, having lost its Balkan province, and with it the rose gardens, undertook to transfer the industry to Asia Minor and planted great numbers of rose bushes in the vicinity of Broussa. The bushes grew and produced plenty of flowers, but so little attar could be extracted from them that the experiment was abandoned. The explanation appears to be that the rose, for the full development of its perfume, requires a cool climate; for within the last two years extensive plantations have been made in the neighborhood of Leipsic, and a manufactory established, which is said to treat now, during the season, three million roses a day, extracting from them about eight hundred pounds of attar per year. The distillery is placed in the middle of the rose garden, so that the flowers reach the stills within a few minutes after they are cut.

A BURGLAR PROOF EXPRESS CAR.

In the improved car shown in the illustration, cages designed to be opened only from the outside, by the depot man at the station, are provided for the safe and the more valuable parcels, and the arrangement is such that, if the robbers succeed in entering the car, they will be exposed to the fire of the messenger from a bullet-proof compartment in each end of the car, the messenger being also able to shoot along the



MORELL AND FERRER'S BURGLAR PROOF CAR.

sides of the car to protect the engineer, or to prevent burglars and robbers from making an entry. The improvement has been patented by Messrs. Miguel Morell and Ramon M. Ferrer, of Santa Barbara, Cal. The car has a double floor and double roof, and in each end is a messenger's compartment, from which he may shoot along the side of the car from outwardly swinging sections provided with portholes or through portholes in its end. At opposite sides of the car, adjoining each messenger's compartment, as more fully shown in the small plan view, are strongly formed barred compartments or cages, for the reception of safes, etc., each cage being reached by a door in the side of the car, having a lock on the outside. Each cage also has a door opening into the body portion of the car, and a passageway is left on one side of each cage from the messenger's room to the central portion of the car. This passageway is designed to be closed at each end by doors carried on the ends of a platform pivoted between the floors, the doors being thus simultaneously opened and closed, and the arrangement being such that a robber gaining access to the center of the car is liable to be shut in there, or in the passageway, by the messenger, the latter taking refuge in one of the end compartments, where he may fire through portholes in the doors upon the robber thus imprisoned. The passageway is also closed by an intermediate door having a lock on the side next the messenger's room. The construction is designed to be very simple and substantial, and yet not very expensive.

Here's a New Malady.

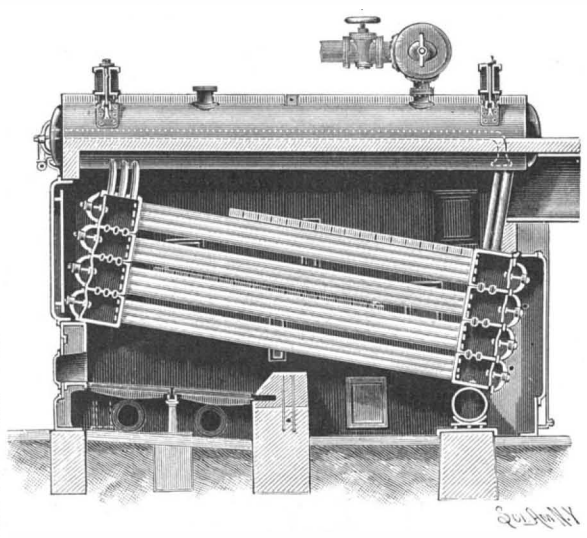
A typewriter was heard to say that when she first got a circular letter to do she thought she had a soft thing. It was a committee notification, the only difference in the letters being the names and addresses, subsequently added. There were five hundred of these letters to be typewritten. She began her work in high glee. After having finished half a dozen or more she had the text by heart, and rattled on at a high rate of speed. After having done thirty or more her speed began to fall off. Shortly it began to be necessary to rest a few minutes between each letter. Then her eyes refused to distinguish the letters. Her fingers worked automatically. The mind failed to understand the meaning of the words. Then the eyes closed with weariness and the fingers groped their way unaided by sight. After a time the text became so confused, the letters so mixed up, that the work had to be turned over to another person. The testimony of other typewriters confirms the nervous excitement and bodily exhaustion that result from repetition. Women who conduct offices of typewriting report that frequently girls have been laid up at their homes and in hospitals from making excessive copies of circular letters. In well conducted offices these are now given in rotation, alternating with other work.

STEEL BRIDGE, MALLECO RIVER, CHILE.

Our engraving, which is from La Ilustracion Sud-Americana, shows a notable bridge of steel erected over the river Malleco, on the Central Railroad of Chile, in the southern part of the republic. Great difficulty was experienced in the construction, owing to the mountainous character of the country. The approximate length of the bridge is 1,200 feet. It is supported on four piers, the highest of which, from level of the river, measure about 315 feet. The total weight of the metal of the bridge is 1,400 tons. Designed by Aurilio Lastarria, a distinguished Chilean engineer. Erected by the Creusot Works, France.

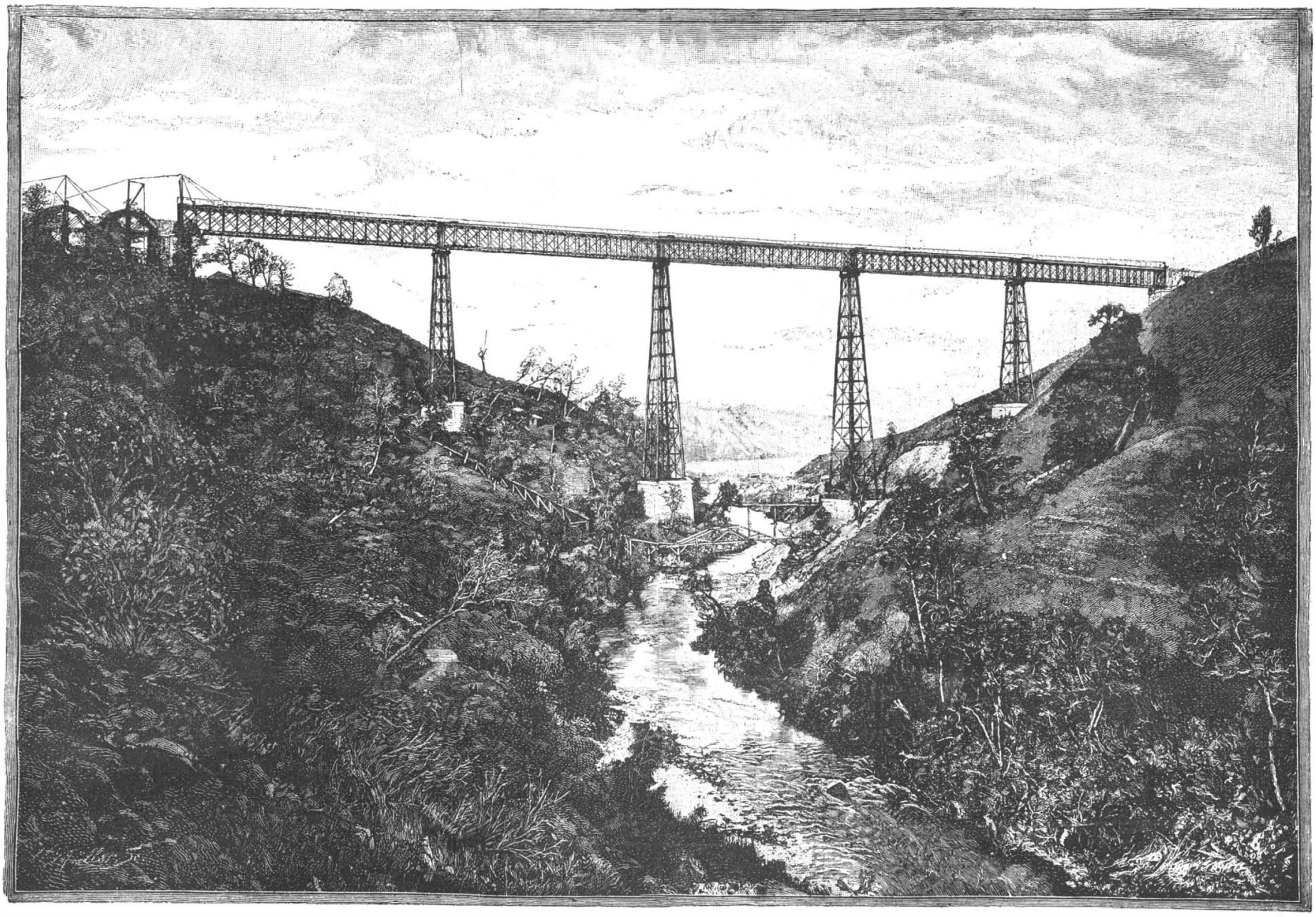
AN IMPROVED STEAM BOILER.

This boiler is made with wrought steel headers, not liable to crack, carries a large body of water, and has large disengaging surfaces for steam, producing absolutely dry steam, as the hot gases from the fire circulate around the heads as well as around all the tubes.



FINGER'S STEAM BOILER.

It has been patented by Mr. Carl Finger, of Wilkes-Barre, Pa. The water tubes are arranged in sets and connected at their front and rear ends to heads arranged in pairs and connected with each other by short pipes at their contacting rims. The uppermost heads at the front and rear ends are each connected to a longitudinal steam drum, connected by a pipe to a transverse superheated steam drum, from which the steam to be used in the engine is taken. Any desired number of sets of pairs of heads may be arranged alongside of each other, there being a separate steam drum for each set, and the lowermost row of heads is connected with the usual mud drum. With this construction no stays are necessary for the heads, so that the entire boiler may be of wrought iron, and the manhole cover can be readily removed from its seat in each head to give access to the several tubes entering the head.



STEEL BRIDGE OVER THE RIVER MALLECO, CHILE.

AN ALUMINUM TORPEDO BOAT.

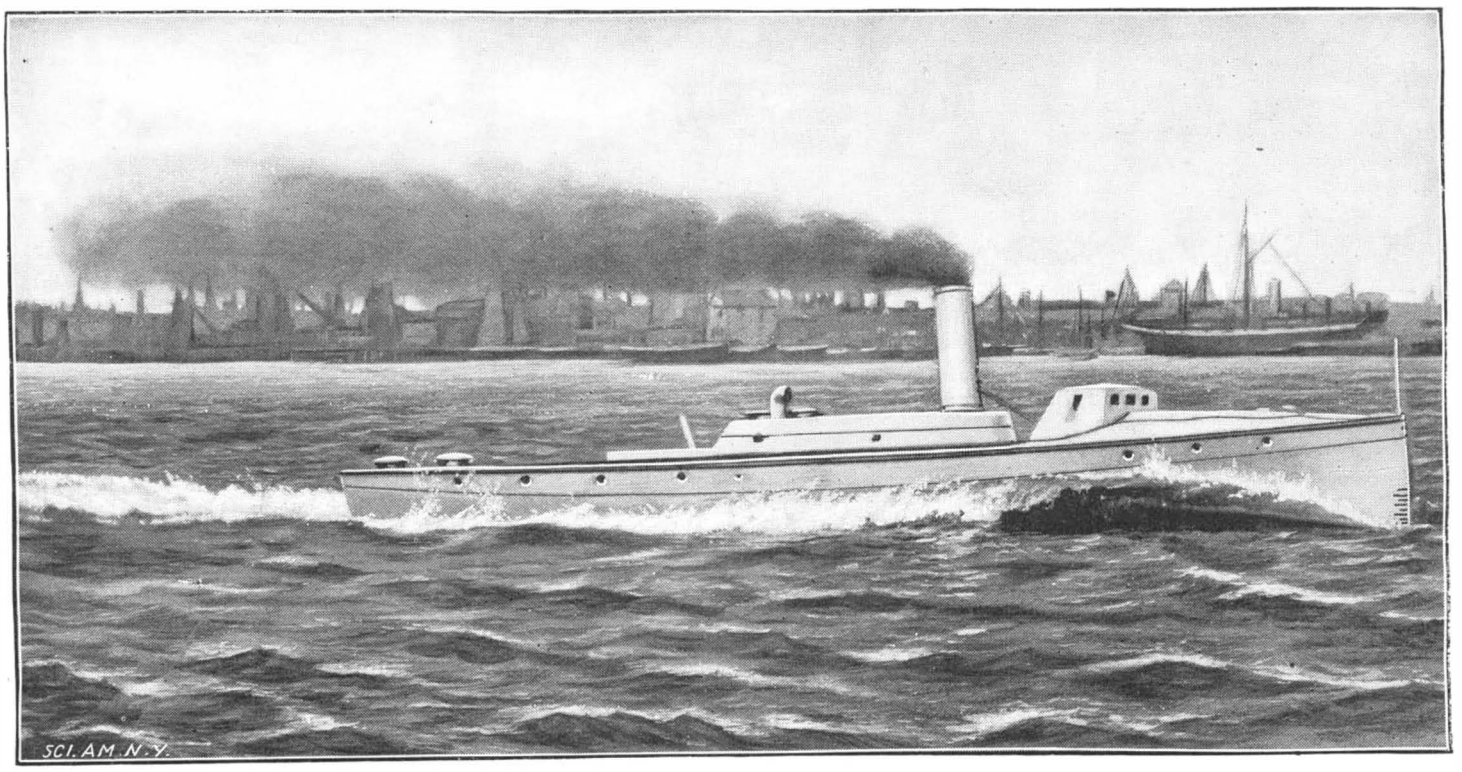
The aluminum torpedo boat which Messrs. Yarrow & Co. have constructed for the French government was recently subjected to trial, so certain engineers, naval officers, and others not officially connected with the vessel might have an opportunity of observing her performance.

The London Times says: The boat is of the second class, being 60 feet long and 9 feet 3 inches wide, a beam 1 foot 9 inches in excess of the older type of second class boat. The chief interest naturally centers in the hull, the machinery consisting of an ordinary set of three stage compound torpedo boat engines and a Yarrow water tube boiler. In design the vessel is on the same general lines as the second class boats recently built by this firm, but the adoption of a lighter material has enabled important alterations to be made in the structure. As compared to a steel boat of the same type, the scantling has been thickened about 25 per cent, in spite of which the total weight of the hull has been reduced about 50 per cent. The builders had the boat weighed when slung on a crane in the docks, the total weight with water in the boiler being 9 tons 8 cwt. Toward this total the hull itself contributed two tons; so it may be taken that an ordinary steel second class torpedo boat's hull weighs four tons. The material of which the hull is constructed is, of course, not pure aluminum, but an alloy consisting of 94 per cent of aluminum and 6 per cent of copper. A large number of experiments have been made by Messrs. Yarrow and by the French government, the results of which point to the proportions adopted being found best for the purpose.

The chief result of using the lighter metal has been that a speed of over 20½ knots was obtained on the official trial, carried out on September 20 under the supervision of a French naval commission, of which Captain Le Clerc, of the French navy, was president. The maximum speed of torpedo boats of this class in the British navy is about 17 knots.

It will be seen that by using aluminum in place of steel in the hull construction—for in other respects the boat is on known lines—an increase of speed of 3½ knots has been obtained, in addition to which there are other subsidiary but by no means unimportant advantages dependent upon the decrease in weight of hull structure. Among these are ease in lifting, additional buoyancy, and freedom from vibration. The latter feature is really remarkable in the new boat, which steams at her highest speed with a degree of vibration, to quote the report of the official trial, "not appreciable;" in fact, when running at her best speed the boat was so steady that one could make notes in the after cabin with facility. Those who are acquainted with the performance of the average torpedo boat when running at speed will appreciate the great advance that has been made in this essential feature, for excessive vibration does much to reduce the efficiency of these high speed craft as engines of war. No doubt the greater steadiness is largely due to the improvements in engine balancing introduced of late, but Messrs. Yarrow & Co. attribute it chiefly to the increased scantling and the non-resilience of the alloy used when it is manufactured in the manner requisite for producing ship plates and angles—for aluminum is among the most resilient of metals when treated in some ways.

Mr. Yarrow states that the price of the material for the hull and fittings varied from 3s. to 5s. per lb., and the metal used in this little boat cost over £1,000.

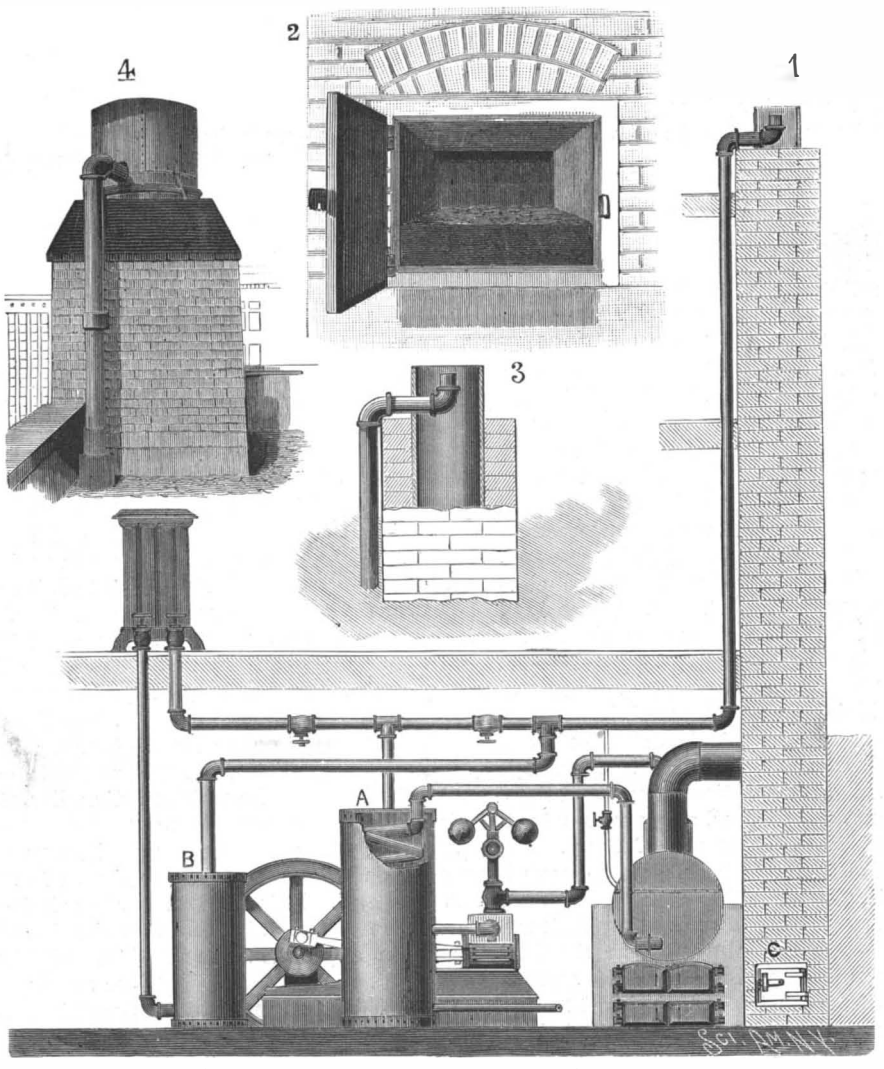


YARROW TORPEDO BOAT MADE OF ALUMINUM.

THE "EUREKA" SMOKE BLEACHER.

The illustration represents a very simple, inexpensive, and automatic device for extracting the coloring matter from smoke, thus enabling steam users to readily comply with the smoke ordinances of cities. It also, by regulating the draught of chimneys, is designed to cause perfect combustion most of the time, thus saving materially in the fuel consumed. The improvement is the invention of Mr. James T. Sands, 510 Pine Street, St. Louis, Mo., and consists in extending the exhaust steam pipe either outside or inside the chimney to within about four feet from the top. Live steam is also connected to the exhaust, to be used in case of emergency. A vacuum is produced by the velocity of the steam entering the air, and a slight down draught is also caused, carrying the carbon saturated with moisture of the steam to a soot box at the bottom of the chimney. The gases in the chimney receive an extra impetus in filling the vacuum, thus drawing an additional amount of oxygen into the furnace, and the draught in the chimney is uniform, because governed by the velocity of the steam at 212 degrees Fah., the point of condensation. Ninety-six per cent of the carbon entering the chimney is said to be precipitated, and can be sold for lampblack for making inks, etc. The other four per cent is either precipitated on the roof or chemically changed, as no color is visible from four to ten feet from the chimney.

In the illustration Fig. 1 shows the bleacher connected with the steam exhaust, A being the water heater connected with the engine exhaust, B a vapor tank, and C a carbon or soot box at the bottom of the chimney; Fig. 2 shows the carbon box open and the way the carbon is deposited, as represented by a photograph, the size of the box being 18 inches by 24 inches by 24 inches; while Fig. 4 is an exterior view of the chimney top and Fig. 3 is a sectional representation, showing one form of the exhaust steam discharge near the top of the chimney. The distance from the top of the chimney at which the discharge is made, as also the form of the discharge pipe and its nozzle, may be considerably varied, according to the height and draught of the chimney.



SANDS' APPARATUS FOR BLEACHING SMOKE.

This device has been in successful operation for the past eight months on the chimney of the Roe building, a large office structure in the city of St. Louis, Mo., and by actual test ninety-six per cent of the carbon entering the chimney was found to be precipitated, analyzing: 2·06 per cent moisture; 34·26 per cent volatile matter, mostly carbon, with some salts of ammonia; 63·68 per cent ash, metallic, mostly ferrous oxide; total, 100; which shows much less volatile matter than either London or Glasgow soot. A close observation, covering the past eight months, presents some peculiar phenomena. Most of the time nothing is visible coming from the chimney, and although it is three and a half feet in diameter and has a six inch steam pipe within four feet of the top pouring in its vapor, still the chimney looks as though no work was going on, while buildings close by are puffing steam twenty-five feet in the air from exhaust pipes. In this condition a paper placed in the soot box will show only a few drops of clear liquid per minute, shovel in a bushel of coal into the furnace, and in another moment the paper will be covered with small black pellets of carbon, quite moist. During the dry, hot months the carbon was deposited in the center of the soot box at the bottom and had to be hoed out; but in cooler, and particularly damp, weather it was quite moist, extending to the door of the soot box and formed in layers each day. The average

amount collected is one hundred and fifty pounds per month for this small plant—three hydraulic elevators, a small dynamo, and heating building, mostly by elevator exhaust steam. The experience with this bleacher has seemed to develop the fact that there are conditions of the atmosphere which defy precipitation. At times when all the chimneys with smoke-abating devices are pouring a volume of thick, black smoke into the air, this bleacher precipitates a less amount of carbon, and the smoke is a light gray or straw color. Ordinarily, smoke and steam (as noticed when the exhaust pipe is attached to the chimney) have an affinity and easily commingle; but on these particular days the steam and smoke go into the air side by side, but never blend; these are the days when people say it is close, hot, sticky, damp, and generally uncomfortable.

The effect of the uniform and increased draught was found to be very marked, for no matter what the condition of the atmosphere, the furnace fire was always bright and of a whitish color, when formerly it was never hotter than red, and varied in briskness with the conditions of the atmosphere. The combustion has been absolutely perfect most of the time, and it has seemed to matter little what quality of coal is used, for during the recent strike resort was had to anything in the shape of coal—full of slate, sulphur, iron, etc., even slack and coal with only thirty per cent fixed carbon—all seemed to burn the same. The extra amount of oxygen drawn into the furnace by the vacuum so near the top of the chimney seemed to hunt out the particles of carbon and when found consume them.

The device, it is claimed, can be used on ocean and river vessels, and on locomotives when the grades are slight, the locomotives being equipped so the old method can be used for heavy grades and the new for level running, thus saving in fuel and doing away with sparks and much of the noise. Patents have been taken out for the improvement in Canada, the United States, England, France, Germany, and other European countries.

British Emigration.

The October circulars of the Emigrants' Information Office, Westminster, London, England, show the present prospects of emigration. This quarterly information is supplemented by a monthly report in the Labor Gazette. It should be noted that the steerage fares to Canada and Australasia are exceptionally low at the present time, that free passages for female domestic servants to Western Australia and to Natal have been stopped, and that assisted passages for such servants to Cape Colony have been resumed. The warning against the emigration of clerks to the colonies still holds good. It is too late for emigrants to go to Canada this year, unless they have friends or situations to go to, or have money enough to keep them through the winter. During this last summer the demand for ordinary farm hands has been less than in previous years, though really experienced men had little difficulty in obtaining work. There is no demand for mechanics. In New South Wales the coal mining industry has improved at Newcastle, and the number of unemployed at Sydney has been on the decrease, but there is no opening at present for more labor, either in town or country. During the first six months of this year nearly 6,000 of the unemployed were sent by the Government Labor Bureau from Sydney, Newcastle, Lithgow, Goulbourn, and other centers, to search for gold, and over 2,000 were assisted to work in other occupations. In Victoria there has been a fair demand for blacksmiths and farriers at Melbourne at reduced wages, but otherwise the metal, building, and other trades are all amply supplied with labor. The yields of the Victorian gold fields continue to increase satisfactorily. In South Australia there is an ample supply of all kinds of labor. There is no demand at present, either at Brisbane or in country districts, for any more hands. In Western Australia the new gold fields in the southwest continue very busy; and large numbers of miners have arrived from other parts of Australia. Tasmania offers no openings at the present time to the ordinary emigrant without means of his own. Reports from all parts of New Zealand state that, with some few exceptions, all branches of work are slack everywhere, and that unskilled labor is especially plentiful. In Cape Colony there is no prospect of any kind of artisan finding employment on the government railways or elsewhere. In Natal most branches of labor are well supplied, and many enginemen, firemen, etc., on the government railways have been put on short time. In Mashonaland and Matabeleland there is no opening for emigrants without capital. The British consul at San Francisco, in his recent annual report, especially warns Englishmen against paying premiums to agencies in this country for instruction in farming in California. Lord Derby recently opened the session of the Manchester Geographical Society with an address on Canada. After describing the migration of young farmers from Eastern Canada to Manitoba, he said that a settler would feel in Ontario that he was not altogether in a new country, and the farms very much resembled our own. As to Manitoba, he was not sure whether it had not been a little overdone.

An Easy Method of Keeping Warm.

I should like to call attention to an easy method of warming one's self when other and more common means are not available. It is a method that I suppose is well enough known to the profession, but probably not often used. I allude to warming the body by merely taking deep inspirations.

On one very cold afternoon of last winter, though walking briskly along, I was uncomfortably cold; feet and hands were very cold, and my ears so chilled as frequently to require the application of my heavily gloved hands. In addition, the whole surface of the skin was unpleasantly chilled; "creeps" ever and anon running up and down my spinal column and radiating thence over the body and extremities; in short, a condition that every reader of this little article has doubtless many a time experienced. I then began taking an exercise often employed before with benefit: deep forced inspirations, holding the air as long as possible before expulsion.

After a few inhalations the surface of my body grew warmer, and a general sense of comfort pervaded me. Continuing, the next to feel the effects of the effort were my previously frigid ears. They grew agreeably warm, and within the time required to walk three blocks, at the previous pace, hands and feet partook of the general warmth, and I felt as comfortable as if the same length of time had been passed by a glowing fire.

The happy results obtained from this simple method are probably owing to several causes:

The cold, of course, chills the surface of the body and contracts the superficial blood vessels, usually affecting first hands, feet and ears, and afterward the general body surface. Contraction of the blood vessels results both in less blood to the part and in stagnation of the current, thus rendering the tissues still less able to resist the cold. Deep forced inspirations not only stimulate the blood current by direct muscular exertion, but also by compressing and expanding the lungs the flow of blood is greatly hastened through this organ, and on account of the increased amount of oxygen inhaled, this abundant supply of blood is thoroughly oxygenated, tissue metabolism is increased and more heat necessarily produced.

Many times unavoidable exposure, as in riding, driving, standing and the like, for a longer or shorter time in the cold, has been the cause of severe and even fatal congestive troubles, such as pleurisies and pneumonias, and a means of quickly stimulating the flagging peripheral circulation which a person has always with him, and which can be employed without moving a step, is one that ought not to be neglected or forgotten.—E. B. Sangree, M.D., American Therapist.

The Star of Bethlehem.

Some time ago various newspapers of Europe and America contained the startling intelligence that the star which guided the "Wise Men" would again appear. This star was connected with that celebrated one which 318 years ago suddenly disappeared from the constellation Cassiopeia, and it was found that this star of 1572 had previously appeared in the years 1264 and 945, and—if counted back—must have appeared in the year of the birth of Christ. If these facts were well established, we must certainly expect the star to appear again in our days. We should then see a new body in the heavens, entirely unlike any fixed star, to be seen in full daylight, which would, in a short time, again disappear.

Every astronomer in recent times has asked hundreds of questions on this subject. Is it true that the Star of Bethlehem will again appear? Is it periodical? Is its place in the sky appointed? The next question is, What really happened in 1572?

It was a few months after St. Bartholomew's Night. Tycho Brahe, the great observer of those days, tells us that: "One evening as I was watching the heavens in my accustomed manner, I saw, to my great astonishment, in the constellation of Cassiopeia, a brilliant star of unusual clearness." This was on November 11, 1572. Three days before the star had been seen by Cornelius Gemma, who spoke of it as "this new Venus." In December of the same year, its luster began to wane; and in March, 1574, it had entirely disappeared, leaving no trace. As to the stars of 945 and 1264, we have no authority except that of the Bohemian astrologer, Cyprian Lowitz. No historian mentions them, and the Chinese chroniclers, who watched all appearances in the sky, with great care, do not speak of them. Even granting the appearance of these stars to have been a fact, their resemblance to the Star of Bethlehem is doubtful. It is true, that by counting back we come to the years 630, 315 and 0; but the star should have again appeared some time between 1880 and 1891.

With regard to the Star of Bethlehem there are five assumptions. 1. It had no existence, and the entire statement is a beautiful oriental fairy tale. 2. The fixed star, seen by the Wise Men, was Venus, at the time of its greatest splendor. 3. It was a periodical star like that of 1572. 4. The phenomenon was occasioned by a conjunction of planets. 5. It was a comet. Of these assumptions, the most probable is the second. That it was a periodical star is scarcely likely, for Ptolemy and Ma-tuan-lin would have spoken of it. The fourth statement was suggested in 1826 by the German astronomer Ideler, and repeated by Encke in 1831. In the year 3 B. C. there were conjunctions of the planets Jupiter, Mars and Saturn on May 29, September 3, and December 5, but on none of these days were the planets nearer together than a degree, so that the Wise Men must have been very near sighted to take them for one star. The fifth assumption is also not to be considered, for people already knew how to distinguish a comet from other stars, and besides, we have no knowledge of a comet at that time.

For all these reasons we have not the least occasion to expect the return of the Star of Bethlehem at the close of our century. And even if such a star should appear it would simply be the twenty-sixth such case observed in historical times, and the interest attached to it would be purely astronomical.—Public Opinion, from Camille Flammarion, in the Stuttgart Deutsche Revue.

The Interior Friction of Oils.

Petroff, who has occupied himself very extensively with the examination of lubricants, has investigated the interior friction of oils by means of an apparatus invented by himself, and has given his results in tabular form and graphically by a series of curves. According to his results, the degree of transparency of lubricants, the refining process, viscosity, flash point and fire point give no basis for estimating the degree of interior friction, though all are of importance. If two oils which at the same temperature possess different interior frictions be mixed, the mixed product will yield a characteristic curve corresponding to that of an oil the qualities of which lie between those of the two components. Consequently, the excessive friction of any thick lubricant may be reduced by mixing with it small proportions of solar oil, pyro-naphtha or kerosene, or any oil possessing low interior friction. But this addition can be useful only when the added product does not separate to any great extent. The addition of such light oils can, of course, be easily detected through the flash point and the fire point. The addition of various resinous materials increases friction in the machinery and in the lubricant itself; while these products have also an injurious chemical effect upon the metallic surfaces subjected to friction. It was also frequently observed that samples of the same oil that were received in the factory at different times did not yield the same characteristic curve, though filling all requirements. This fact is naturally important to consumers on economic grounds.

The New German Trade Mark Law.

In pursuance of the general plan of reconstruction and improvement which has been in operation during the past two years in the German Patent Office, and which has done away with some of the antiquated practices which, until recently, have prevailed in the administration of that department of the government, a new law has been enacted, establishing a new system in regard to the registration of trade marks. This new law went into operation on October 1. It declares that all marks registered under the old law are invalid and it gives a definite term within which old marks may be re-registered in compliance with the new requirements. The mark is granted for a term of ten years, which term may be prolonged.

In filing an application for registry of a trade mark in Germany, it is necessary for a non-resident to prove that he has received similar protection in the country of origin, and to that end a certified copy of the trade mark as registered in the country where applicant is domiciled must be furnished and the same must be legalized by the German consul. The general requirements are quite similar to those at present in force in the United States practice. In case any one files a mark which had been registered under previous acts, it is well to furnish a certified copy of the original registration. It is rather curious that the necessity for new registration of German trade marks has been effected by direct legislation, while in United States the same necessity arose through the celebrated decision of the Supreme Court in the case of United States vs. Steffens et al., which rendered all trade marks registered under the act of 1870 void, owing to the unconstitutionality of this law.

PAPER from sunflower stalks has recently been produced in the south of England, but as the fiber in the stems is too short to produce a material of fine texture suitable for writing or printing upon, the experiment is not likely to be continued. Some 500 lb. of sunflower stalk produced, by the aid of proper paper-making machinery, about 320 lb. of paper. This was not suitable for other purposes than packing, and to make a good paper it was estimated that the addition of 50 per cent of rags or similar material would be necessary.

THE NEW HARLEM RIVER SPEEDWAY, NEW YORK.

(Continued from first page.)

length of the speedway rise abruptly above the river to a considerable height. The general course of the river is north and south, and the speedway follows along its edge. As, owing to the very rocky ground, any extension to the west was unduly restricted, a special grant from the Federal government was received, in virtue of which it was allowed to encroach beyond the bulkhead line of the Harlem River, between One Hundred and Seventy-eighth and One Hundred and Eighty-fifth Streets, to a maximum of 21 feet at a point just north of Washington Bridge. We have already described pretty fully the general features of the work;* it will be enough to say that it is to represent the best possible quality of what horsemen call a "dirt road."

On the south it starts at One Hundred and Fifty fifth Street almost at the western end of the One Hundred and Fifty-fifth Street viaduct, where it is about 100 feet above high water mark. From this point it gradually descends at the rate of about 4 feet in 100 until at One Hundred and Sixty-sixth Street it reaches its lowest grade, 6 feet above high water. It now assumes an undulating grade until One Hundred and Seventy-second Street is reached, when it begins to rise, and at High Bridge is 17 feet above high water. It then continues north, and with further undulations until it reaches the 6 foot grade at its northern end, where it joins Dyckman Street, which leads into Broadway, the old Kingsbridge Road. Its total length is 43 blocks, the northern end being very nearly at One Hundred and Ninety-eighth Street. Its width varies. The roadway proper at One Hundred and Fifty-fifth Street is 70 feet wide, increasing to 100 feet by the time One Hundred and Sixty-fifth Street is reached. At High Bridge it has to contract to 63½ feet in order to get through one of the arches.

Referring to our large cut, the more distant of the two bridges is High Bridge, and it will be seen how the narrow arches limit the possible width.

In the foreground of the same cut is seen one of the large arches of Washington Bridge, beneath which the road goes. This would seem to offer indefinite room, but here the river prevents it, and in spite of the grant from the government, the roadway has a width here of but 49 feet 6 inches. This is its narrowest place. Between the two bridges it varies from 61 to 80 feet, and north of Washington Bridge it is 100 feet wide.

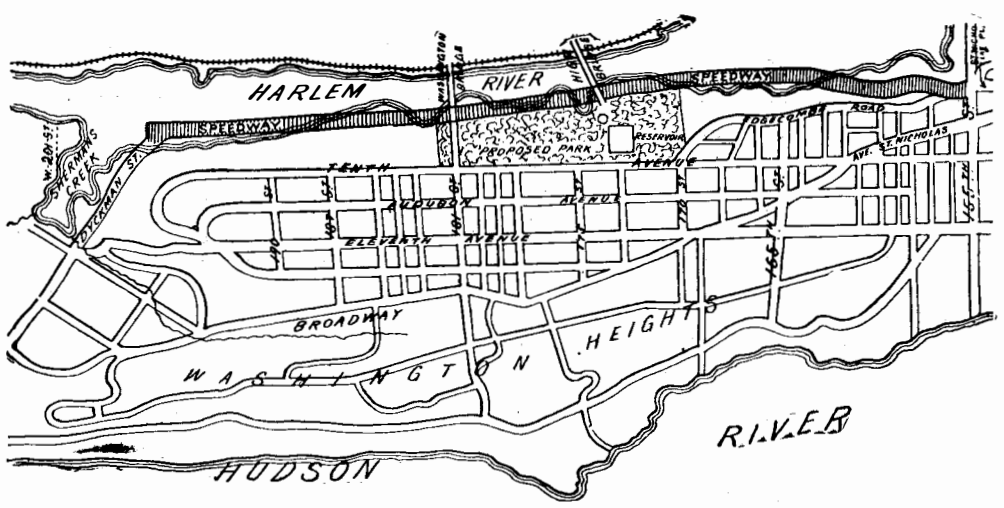
Footpaths are to be constructed on each side of it. The outer or eastern pathway is of nearly the grade of the road, and varies from 10 to 20 feet in width. At High Bridge, where an entire archway is occupied by the road, this path is to be carried by an iron structure around the outside of the pier. The inner or western pathway, varying from 20 to 30 feet in width, departs in places from the grade of the road, and will, in one place, be 28 feet above it. At High Bridge and at Washington Bridge it passes through archways to the west of those occupied by the roadway.

Three subways beneath the road are to be provided; they will be 12 feet wide and 8 feet high to the crown of the arch. One of these will be at 163d Street, one at High Bridge and one at Washington Bridge.

Not the least interesting features of the speedway will be due to the public works and buildings along the river shore. The High Bridge is a representative of what was best in the civil engineering of the past generation. Its beautiful stone arches form an appropriate background in our large cut, appearing through the steel arch of the Washington Bridge, which structure is one of the great bridges of the world. At High Bridge and along the river's edge, to the south, is to be a public park, which will add to the prospect. At High Bridge proper there is a pumping station and reservoir, with buildings, all which will form impressive features of the scene; on the opposite bank of the Harlem is the Ship Builders' Home, while on the New York side University Heights, with the new buildings of the University of the City of New York, may be ranked among some of the more striking elements of the scene.

Various features of the construction are shown in our cuts, and a great deal of the work here illustrated is now nearly completed. Cribwork is a necessity of the case, as stonework would be of prohibitive expense. In the cut showing the completed speedway and walks the elevation of the inner sidewalk is shown, and the impressiveness of the work is well brought out.

Reference should also be made to the little map, which shows clearly the course taken by the speedway. With Riverside Drive and the Boulevard on the west, overlooking the Hudson River, and the speedway on the Harlem, the drivers and riders of New York will have unrivaled roads on which to prosecute their calling.



MAP OF THE HARLEM RIVER SPEEDWAY.

* See SCIENTIFIC AMERICAN, March 31, 1894.

Effect of a Receipt in Full.

It was a rule of the common law that an express promise of a creditor, if a release was not given, or the evidence of the debt was not surrendered, to accept in payment a less sum than was really owing him would not operate as a payment or as an accord and satisfaction. But the Code declares that "all receipts, releases and discharges in writing, whether of a debt of record or a contract under seal, or otherwise, must have effect according to the intention of the parties thereto." The uniform construction of this statute has been that, though the sum paid may be much less than the debt really due, if a receipt in writing is given, intended as a full discharge of the debt, in the absence of evidence of a mistake of material facts, or of concealment of such facts, or of misrepresentation, the receipt must have operation according to the intention of the parties. Eufaula Nat. Bank vs. Passmore. Supreme Court of Alabama. 14 So. Rep., 683.

Brain Gymnastics.

Modern studies of the brain, says Modern Medicine, have placed in a very clear light the fact that in gymnastics, piano playing, and skilled movements of all sorts, the training consists not simply in a discipline of the muscles involved, but is especially a training of the cells at the surface of the brain—the so-called cortical portion of the brain.

In many cases of paralysis, the failure of the patient to recover the use of the affected muscles is the result of neglect properly to train or educate the muscles. The patient is not always able to do this himself, for the reason that after the injury involving the cerebral region has been repaired, the muscles are often left in a state of such complete disability that the patient is not able to command them by his will; that is, although the connection between the will and the muscles is restored, the muscle is too weak to respond—not that the muscle is unable to contract, but it is unable to contract and at the same time do the work required of it in moving the parts to which it is attached. In these cases, passive movements are of the greatest assistance. The masseur should say to the patient (in a case involving the lower extremities, for example), "Draw up your foot," and at the instant when the patient makes the effort to draw up his foot, the masseur should raise the foot for him, or give such assistance as is necessary to raise the foot, perhaps leaving the patient to suppose that he has executed the movement himself, thus giving him encouragement and restoring his confidence. After this procedure has been executed for a few days, it will be noticed in many cases that there is a decided increase in the voluntary control of the patient over the affected part; and after a prolonged course of treatment, reaching, if necessary, over weeks or even months, the patient may be able to control the paralyzed parts in a very satisfactory manner. In like manner, the patient may even recover the power of speech after having once lost it. If the patient is able to understand the words spoken to him, although unable to utter them himself, in some cases it is possible to restore the ability to speak by calling his attention to the form assumed by the muscles of the lips and other muscles involved in articulation, and directing him each day in executing these movements, just as a deaf person is taught. In a case recently reported by Kuchler, a patient by this means acquired the use of more than a hundred words by only six weeks' practice, after having been speechless, or nearly so, for nine years, as the result of a stroke of apoplexy.

EVERY workman in Japan wears on his cap and on his back an inscription giving his business and his employer's name.

Wild Flowers of Autumn.

Composite plants, which include such beautiful ones as asters and goldenrods among others, do very much toward making pleasurable a visit to the fields and woods at this season. Toward the close of September and lasting through October, there are dozens of each genus in flower here. I am glad to see these lovely flowers cultivated more than they were. Our fields are rich in goldenrods. One of the earliest to flower is the one known as Solidago odora. The foliage is pleasantly scented besides. Two tall-growing, showy ones are S. altissima and S. canadensis. Lanciolata has flattish heads of flowers, and the leaves are lightly scented. Another one, nemoralis, bears a large head of flowers. A really beautiful species is cæsia. It is of comparatively slender growth, does not branch much, and bears golden yellow flowers close to the shoots; so that some of them which are not branched at all look like strings of yellow flowers.

Another one, and the only goldenrod which is not golden, flowers in much the same way. This is the bicolor, and it has white flowers. Any one desiring a display of golden flowers in his garden in the fall should get a collection of these goldenrods now while they are in bloom. Not in the least behind the goldenrods in merit are the asters. This locality is rich in the great variety of them it possesses. The best of all is certainly Novæ angliæ, the New England aster. This has large purple flowers, abundantly produced on strong, leafy shoots and it grows to a height of six to seven feet. Like most other asters, it is easily raised from seeds. Next to this one, I think patens makes the most display. While quite firm and erect, the plant has a slender look. It bears large blue flowers in great profusion. This one grows to bud two to three feet in height. There are dry hillsides here which are a blaze of blue toward the close of September when this aster is in its prime. Near watercourses a light blue, large flowered and large growing aster is to be found, often bending over with the weight of its flowers. This is puniceus. It has a reddish stem and large rough leaves. Corymbosus, macrophyllus and a host of common roadside asters are found on every hand. On dryish banks the Gerardias are making a fine display now. There are two species, G. flava, with large yellow flowers, looking for all the world like a foxglove, and G. purpurea, purple and smaller flowers. In swampy places the lovely cardinal flower, Lobelia cardinalis, is almost out of bloom. I mention it now in order that I may call attention to its adaptability for setting in partly swampy places, where many another plant would not grow. There is no like plant of tropical nature that could take the place of this beautiful native.

Passing through the woods a few days ago, I noticed many beautiful berry plants. Many of these plants had borne pretty blossoms in the spring, and now were as pretty in their display of fruit. There was the Smilacina racemosa, bearing panicles of scarlet fruit where its yellowish white flowers had been in May. The preacher-in-the-pulpit, Arum tryphyllum, had close heads of scarlet berries, which were prettier than its bronze specter in the spring. The Medeola virginica was there likewise, its erect leafy stem crowned with three or four bright black berries. Actea alba displayed a small cluster of white berries, and the creeping evergreen, Mitchella repens, the partridge berry, lovely scarlet ones.

Among shrubs and trees there are many now which are bright with fruit. There are two roses, Rosa carolina and R. lucida, both bearing deep red berries. The former grows in swamps, the latter in dry ground. The Taxus canadensis bears orange red berries. I had often heard that these seeds should not be eaten, but children eat them from our bushes, and seem to thrive on them. There are three species of native thorns displaying their scarlet fruit, Cratœgus coccinea, C. cordata and C. crus-galli. Of these, coccinea has the largest fruit, appearing almost like small crab apples. Cordata has small berries, not unlike the European one, oxycantha; crus-galli, the cockspur hawthorn, has rather large fruit, but it does not become as bright in color as the others do. The large-flowered dogwood, Cornus florida, the deciduous holly, Prinus verticillatus, and the spice bush, Laurus benzoin, are clustered with bright scarlet berries.—Joseph Meehan, in the Country Gentleman.

IT is stated that the Havock and Hornet class of destroyers are unable to use their bow torpedo tubes, as when going at full speed they are liable to overtake the torpedo. It is true that the latter, once fairly on its way, has a speed of 32 knots, but it requires some few seconds to get up speed, and it is this delay which enables the boat to overrun it. The consequences might be serious when firing charged torpedoes.

The Destruction of Derelicts.

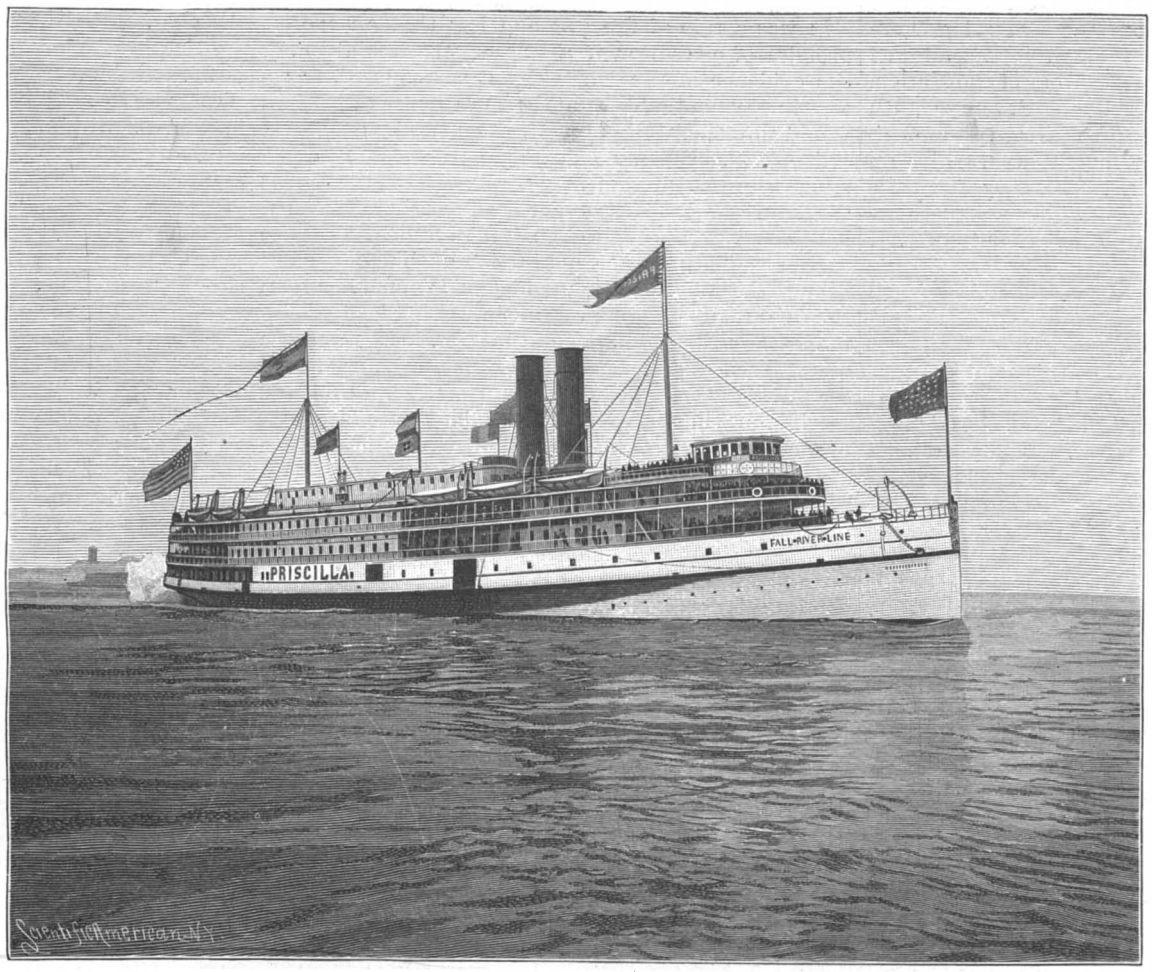
In a recent issue of the monthly Atlantic Pilot Chart, published by the Hydrographic Department, United States navy, it is stated that during the past seven years, 1887 to 1893, the Hydrographic Office received 5,024 reports concerning a total number of 1,628 derelicts, of which number 482 were identified and 1,146 unidentified. The average number of derelicts constantly afloat is estimated to be 232 annually, or about 19 per month. Statistics compiled from the reports received show that the average period a derelict is afloat, after having been abandoned, is about 30 days. The dangerous character of these derelicts is illustrated by the fact that in this period of seven years there have been 45 collisions with them, which caused the total loss of nine vessels and considerably damaged seventeen others. Seventy derelicts have been destroyed, one by torpedoes and the ram of the U. S. S. San Francisco and 69 by fire. Seven other attempts to destroy derelicts by fire are considered to have been unsuccessful, as the derelicts remained afloat for some time after having been set on fire. Five of these seven had cargoes of lumber that had become so waterlogged as not to be inflammable; the other two were in ballast. The efficacy of destroying derelicts by fire is thus illustrated. In the cases of the 59 attempts regarded as successful, the fact that these derelicts were never seen subsequent to the time they were set on fire is regarded as sufficient proof of their destruction.

A Whistling Snake.

The discovery by the Horn expedition to the McDonnell Ranges, in Australia, of a remarkable specimen of natural history called a "whistling spider," whose peculiarity consists in producing a whistling noise by the simple operation of drawing its foreleg across its jaw, seems at the moment to be outdone. Sir William Macgregor, the Administrator of British New Guinea, is now in the field with another extraordinary discovery —a whistling snake. In his latest report Sir William says that a large number of deaths occurred early this year in the Rigo district of New Guinea from snake bite. The administrator points out that the island is infested by a small species of black snake, which is very fierce. The natives declare that whenever a man goes near one it rushes at him, uttering sounds which they describe as resembling a whistle. "Shortly before I was at the government station," writes Sir William Macgregor, "one of these reptiles attacked the government agent, but was killed before it did any harm. A little while before a boy of fourteen years was in the bush near the station when one of these snakes made a rush at him with the usual peculiar whistling sound. The boy thought the noise emanated from some cockatoos in a tree, and began to look for them. He did not discover his mistake until he received a bite from the reptile, from which he died.

Bookmaking Exposition.

The International Exposition of the book, paper, and printing trades was opened at the Palais de l'Industrie in Paris on July 23, and will remain open until some time in December. Many of the French societies for the advancement of art, science and trade make important exhibits. Several foreign nations, including the United States, also participate. Probably the most interesting exhibit is that devoted to the production of books for the blind. This display is largely retrospective. Bookbinding is also well represented. France is a country where collecting has been reduced to a fine art, so that some of the exhibits loaned by amateurs are very fine.



THE STEAMER PRISCILLA, OF THE FALL RIVER LINE.

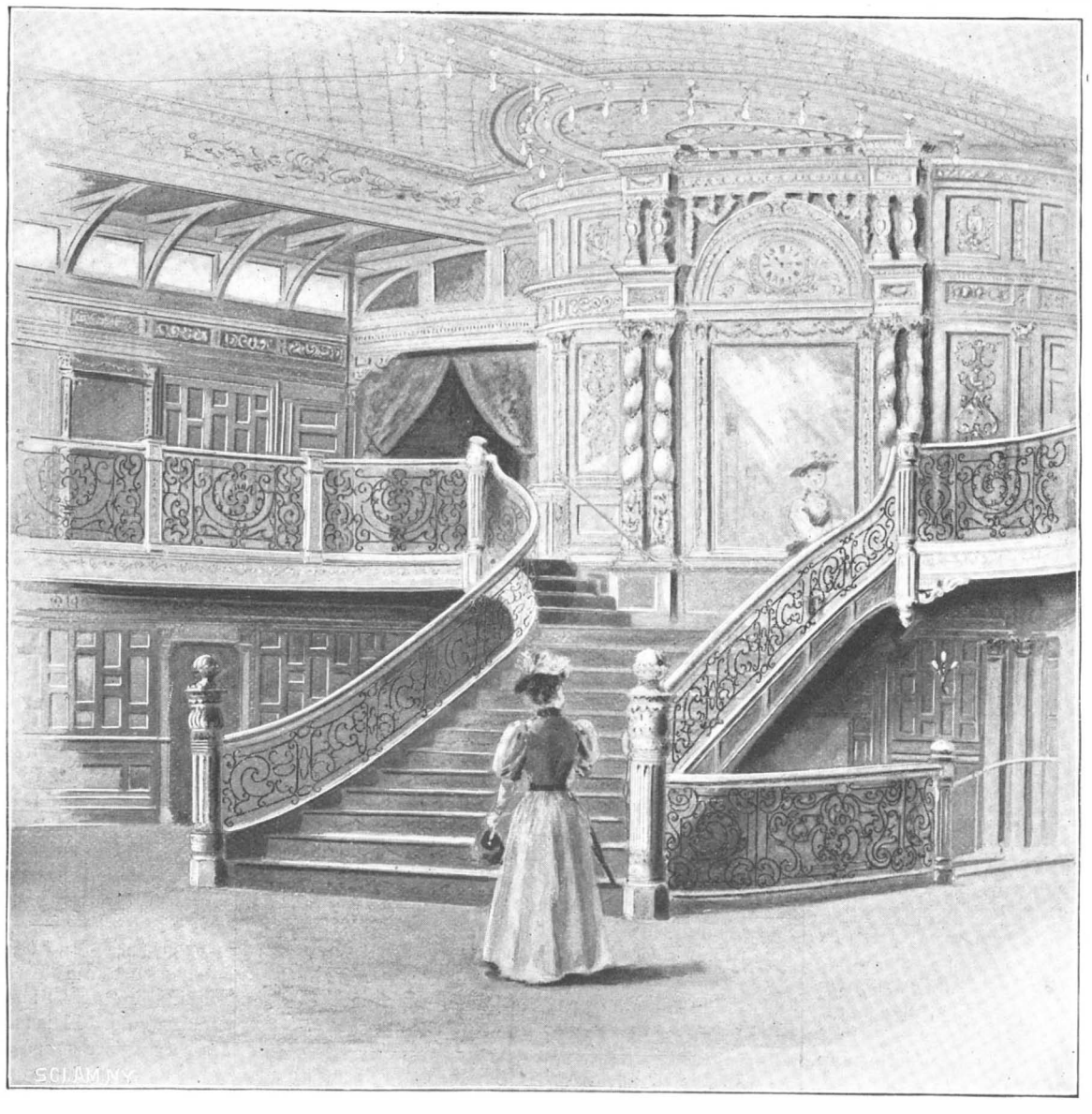
THE GRAND SALOON AND ELECTRIC LIGHTING OF THE STEAMER PRISCILLA, OF THE FALL RIVER LINE.

We illustrate in the present issue the interior of the grand saloon of the steamer Priscilla, of the Fall River line, a vessel which we have already described, and which is one of the most magnificent specimens of naval architecture in existence. The stairway in the grand saloon, of which two views are given, is accepted as one of the most difficult portions for treatment, and the cuts show a most successful design, in whose carrying out the skill of the iron master and of the art modeler were utilized. The columns and paneling, which are seen to be of the most elaborate design, are all made of papier mache, by the firm of H. Sinclair's Sons, of 327 Seventh Avenue, New York, a firm representing the third generation occupied in and conducting the same business —something very unusual in this country. All the paneling, ceilings, and similar work on the boat were the work of this firm. In executing it twelve tons of material were employed, representing eleven months' work of a gang of about sixty men on the boat and twenty-five in the shop. In the grand saloon the decorations are of the purest Italian Renaissance, while in the dining room an equally pure example of East Indian design has been followed. In the painting, gold leaf has been used sparingly, only the high lights receiving it. In lightness and ornateness and in adaptation to every conceivable requirement the papier mache leaves nothing to be desired. It is also fireproof, a matter of great moment in such a vessel as the Priscilla.

The beautiful iron railing, which represents true art work in metal, and which is all hand made, was produced at the works of John Williams, 544–556 West 27th Street, this city. It is not saying too much to assert that the public have been educated to an appreciation of fine art in metal largely by the productions of this firm. In New York and other cities, in the finest hotels, office buildings, and private residences, may be found samples of gates and grilles all hand made, in the most elaborate forging, by this firm.

Their workshop and forge is a most interesting place to visit. It reminds one of the doctrines of Ruskin to see great gates and heavy railings all forged by hand from the bar and plate. A single little leaf in a railing may represent some hours' work of a man. The different members of the design are welded or brazed or otherwise fastened together, even soldering riveting and bolting being required by some of the most intricate designs. The beautiful railing on the Priscilla shows the smaller class of work produced by this firm. In our last issue it will be remembered that we showed the gates and grilles of the Metropolitan Club's palatial home.

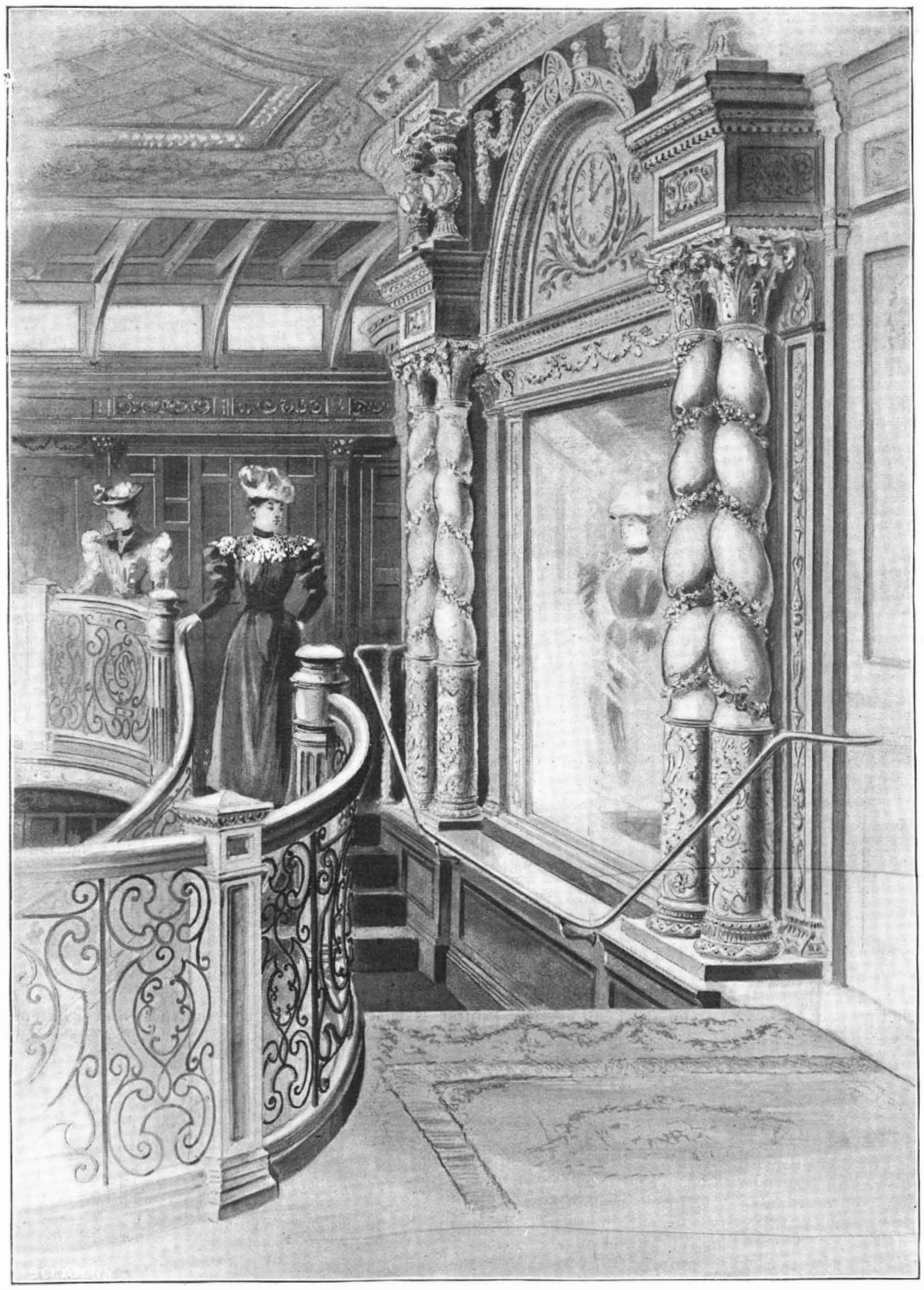
In the last cut we show the great dome electrolier, built by the General Fixture Company, of this city. The dome is 7 feet in dia-



VIEW IN THE GRAND SALOON OF THE STEAMER PRISCILLA.

meter, and is built on an aluminum frame, saving about 200 pounds weight, while it is as strong as if made of steel. Behind its twelve panels of opalescent glass are forty-eight lamps, each one of 32 candle power. An idea of the size of the fixture is given by the fact that in putting it up three men at a time worked inside of it, while riveting on the outside framework. Four smaller opalescent domes, each containing six lights, form a square on the main fixture. The decks are lighted by the same style of fixtures used on the United States government cruisers. Reflectors are arranged so that the light cannot be seen from the bows of the ship, although the decks are perfectly lighted. This enables the ship signal lights to be seen by other vessels. The stateroom brackets are put up on round porcelain pieces, which serve both as backs and carry the cut-out. The brackets are removed by unscrewing and are interchangeable, so that the electrician can readily test the wire. In the dining room all the incandescent lamps are concealed in inverted globes of art glass, or are behind art glass panels on the side. On the mast of the boat is a fixture containing 36 lights. The number of lamps on the boat aggregate 1,987, the entire system forming a unique example of the most advanced type of electric light.

In the SCIENTIFIC AMERICAN of June 30, 1894, will be found a full description of the Priscilla. The vessel is 440 feet 6 inches long over all, 423 feet 6 inches on the water line, 93 feet wide over the guards, with a hull 52 feet 6 inches wide. The registered tonnage is 5,398 tons. The engines are of 8,500 horse power, compound, with four cylinders of inclined type. The cost of the vessel is put at $1,500,000.



UPPER LANDING OF THE MAIN STAIRCASE OF THE STEAMER PRISCILLA.

Work of the Pension Office.

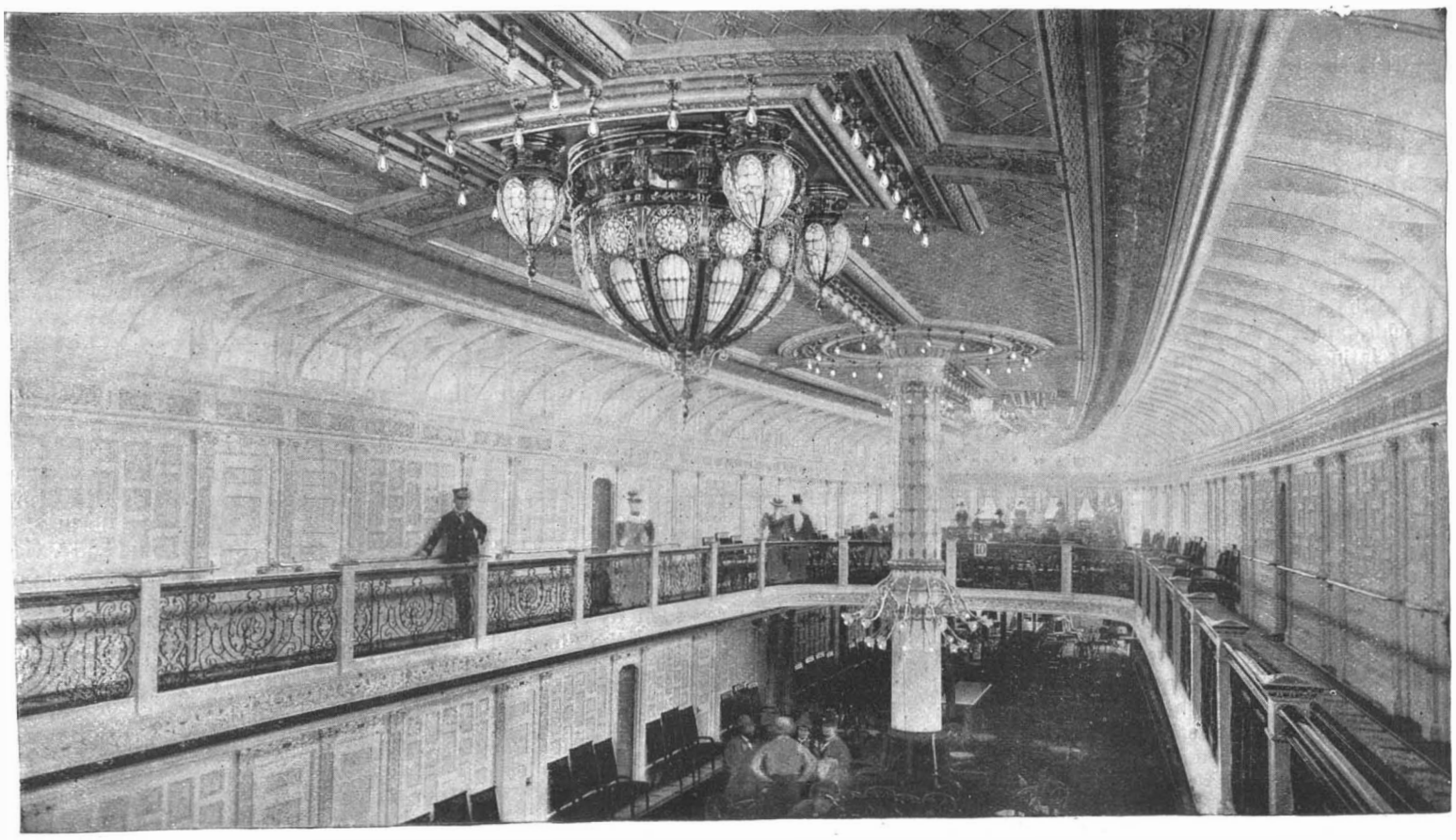
The report of the Commissioner of Pensions for the fiscal year ended June 30, 1894, states that the number of pensioners on the rolls June 30, 1893, was 966,012; that during the year 30,085 new pensioners were added to the rolls and 2,308 previously dropped were restored, while 37,051 have been dropped for death and other causes, and on June 30, 1894, the number of pensioners upon the rolls was 960,544. The number of pension certificates issued during the year was 80,213 and 132,873 claims of all classes were rejected.

There were undisposed of and in different stages of preparation and advancement, on July 1, 1894, claims for pension and for increase to the amount of 619,027, of which 287,209 claims—originals, widows, and dependents—are on behalf of persons not already on the rolls. These claims, save some recently filed, have been examined more than once and found lacking in essential evidence.

New claims of all kinds have fallen off from 363,799 in 1891 to 40,148 in 1894, the fact being that original claims for pensions under existing laws are substantially all in, and the bulk of new claims are for increase or for widows and dependents.

The amount paid for pensions during the year was $139,804,461.05, leaving a balance in the Treasury of $25,205,712.65 of the appropriation.

There were 194 convictions in the United States courts within the year for pension frauds, perjuries, and forgeries.



THE DOME ELECTROLIER IN THE GRAND SALOON OF THE STEAMER PRISCILLA.

Preservation of Our Battle Ships.

At the close of our civil war Admiral Farragut reported that the monitor fleet, created by John Ericsson, was in perfect working condition. The Navy Department at that time (March, 1866) applied to Ericsson to know how it could be kept in good condition. Ericsson wrote in reply, showing how these vessels might be floated into an inclosed basin at League Island, where the water could be pumped out until it was needed to float them again. "A fleet laid up as I propose is," he said, "good for half a century; all, excepting some repairs about the armor backing, engines, hulls, boilers, etc., may be kept in perfect order, and in twenty-four hours fifty ironclads may be transferred from their dry resting place on the surface of League Island to the Delaware, with stores and ammunition on board." For some reason no attention was paid to this suggestion, and some time after Ericsson informed a friend, who proposed to visit the monitor fleet floating in the waters of the Delaware, that he would find them "a fleet of ironclads subjected to the most rapid decay. All that rotting and corrosion can do to destroy the vessels of which a nation expects so much in case of need, you will find," he said, "in active progress."

It is now twenty-eight years since Ericsson gave this advice concerning the preservation of the monitors, and we have had an opportunity to test its value in the light of experience with different methods. We observe that the Navy Department has finally come to his conclusion, so far as laying armor-clads up in ordinary is concerned. This new plan of disposing of armored vessels includes battle ships and coast vessels for use only in case of emergency. It is the intention of the department to transfer to fresh water the battle ships now under construction, just as soon as they have been thoroughly broken in. The place where the ships will be laid up will be League Island, it being the opinion of the Secretary that this is the most desirable fresh water rendezvous on the Atlantic coast. The probabilities are that in his forthcoming annual report, the Secretary will urge Congress to make an appropriation for increasing the facilities of this yard. This being the plan, we would suggest to the Secretary that he consider Ericsson's proposition of a generation ago in the light of unprejudiced judgment.—Army and Navy Jour.

Cellulose and Some of its More Recent Applications.

BY CHARLES A. SILBERRAD, B.A., B.SC.

Though cellulose is an invariable constituent of plants, of whose cell walls it forms the supporting framework, it is rarely found pure, as, except in cellular tissue of the youngest shoots, it always contains more or less ash. Still, cotton wool and Swedish filter paper consist of the approximately pure substance, especially the latter after treatment with hydrofluoric acid, whereby all mineral matter is extracted.

However, the preparation of pure cellulose from any material containing it—e. g., cotton wool—is not a matter of great difficulty, it being only necessary to digest it alternately with bromine water and a dilute alkaline solution until the bromine water is no longer decolorized. The fiber is then boiled in dilute alkali and washed in turn in dilute acid, alcohol and ether, and finally dried.

Thus prepared, it contains a certain amount of hygroscopic moisture, amounting to from seven to nine per cent of its weight; when this is removed, the simplest composition deducible from analysis is $C_6H_{10}O_5$, but it seems clear from its properties that its molecular weight must be many times that represented by the foregoing formula.

Solvents of Cellulose.—Cellulose is insoluble in all ordinary solvents, but is dissolved by certain reagents, of which the two following are the most important: (a) Schweitzer's reagent, which consists of an ammoniacal solution of cupric hydrate. From solution in this liquid the cellulose may be reprecipitated on addition of acids, alcohol, salt, or various other substances, in a gelatinous state, drying to a material closely resembling gum arabic in appearance. (b) A solution of zinc chloride in twice its weight of hydrochloric acid. This solvent behaves very similarly to the first mentioned, except that the cellulose is reprecipitated on dilution. Such solution and reprecipitation afford a ready means of purification.

The solvent power of the first named of the above liquids is the basis of the manufacture of the so-called paper boards. For this purpose sheets of unglazed paper are left in contact with the ammonio-cupric solution for a short time—just long enough for the fibers to be superficially attacked. The requisite number of these sheets are then placed one on top of the other, passed between rollers and dried; by this process they become united into a board-like material, impervious to water, which property is retained at 100° Cent.

Action of Nitric Acid.—If cellulose, e. g., blotting paper, be simply immersed in ordinary strong nitric acid (specific gravity 1·42) it undergoes a curious transformation. Its composition is unchanged, but the strength of the paper is increased tenfold, while at the same time its linear dimensions are diminished ten per cent.

The action of stronger nitric acid and of mixtures of nitric and sulphuric acids in the production of guncotton and the various pyroxylines, as well as the preparation of collodion by dissolving the last named in a mixture of alcohol and ether, are too well known to need any further account here; but the peculiar properties of a mixture of camphor and pyroxyline may be worth noting, as it is of these two substances that celluloid consists.

Celluloid was first prepared by Hyatt, of Newark, U. S. A. It may be obtained either by direct addition of pyroxyline to melted camphor, or by strongly compressing the two together, or lastly by dissolving the two in some common solvent, as ether alcohol.

The method usually adopted on the manufacturing scale is a combination of the second and third above mentioned. The pyroxyline is prepared by treating unsized paper with moderately strong nitric and sulphuric acids, whereby a product is obtained consisting of a mixture of the tetra and penta nitrates of cellulose.

The camphor is dissolved in the minimum quantity of alcohol, and this solution sprinkled upon the dry sheets of pyroxyline in such quantity that there is one part of camphor to two of pyroxyline. On the sheet so treated another is placed, and the same process repeated, and so on till a sufficient thickness is obtained.

There is thus produced a translucent mass which is worked between rollers, first in the cold and then at a higher temperature; it is next subjected to hydraulic pressure at a temperature of about 60° Cent., for twenty-four hours, and finally cut into sheets of the desired thickness and dried for several days at a moderate heat. The substance so obtained appears quite homogeneous, and may be cut and turned in the cold or moulded under pressure at a higher temperature.

It is very readily colored by pigments or dyes, which may be either mechanically mixed in a state of powder or dissolved with the camphor in the alcohol.

Artificial tortoiseshell is produced on the same principle as damascene steel, i. e., by welding together alternate plates of differently tinted celluloids.

As might be anticipated from its composition, it is extremely inflammable, but has been shown to be non-explosive under all conditions.

Action of Sulphuric Acid—Vegetable Parchment or Parchment Paper.—If cellulose, e. g., blotting paper, be rapidly passed through moderately strong sulphuric acid (specific gravity 1·5—1·6), and then well washed in water, it acquires properties very similar to those of parchment. The resulting preparation is now extensively used under the names of vegetable parchment or parchment paper.

This change is due to the conversion of the cellulose on the surfaces of the paper into a peculiar modification known as amyloid, which may be precipitated pure in a gelatinous form by diluting a solution of cellulose in concentrated sulphuric acid.

If cellulose be left in contact with acid of specific gravity 1·5 for some time, it becomes friable, forming a substance called hydro-cellulose, which is soluble in alkalies. By means of this reaction the cotton may be separated from the wool in a mixed fabric, as the latter is unacted upon.

Action of Alkalies—Mercerization.—If cotton cellulose be treated with a concentrated solution of soda or potash and then washed, it is found to have undergone a remarkable change in properties. From the name of its discoverer (Mercer) this change is termed mercerization.

The way in which Mercer was led to his discoveries is interesting as showing how one result may lead to another wholly unconnected with it. He was making a series of experiments to determine whether any alteration occurred in the composition of a solution on filtering it, and in the course of these he passed a strong solution of caustic soda through several layers of cotton cloth. He certainly found a considerable change in the composition of the solution on filtering, but was able to fully account for it by what turned out to be the far more important change produced in that of the cotton cloth, for this proved to be approximately expressed by the formula $C_6H_{10}O_5NaOH$; and though, on washing, all the soda was removed, the properties of the fiber were found to have undergone a marked change. Their length was contracted to the extent of twenty per cent, while at the same time there was an increase of thirty to thirty-five per cent in strength. A still more important alteration was the increased affinity for such dyestuffs as will dye cotton without a mordant, e. g., the diphenyl derivatives—Congo red and the benzidine dyes.

Cellulose Thiocarbonate.—Certain theoretical views led Messrs. Cross and Bevan to an examination of the action of carbon bisulphide on the mercerized cotton, with results which will probably have most important practical applications in the near future, and which have already formed the subject of at least one patent.

If the above mentioned compound of cellulose and soda be exposed to the action of the vapor of carbon bisulphide, it is gradually converted into a yellowish mass which, when placed in water, swells up, and finally dissolves to form a solution of cellulose thiocarbonate.

This same solution may be more readily produced by bringing together two parts of cellulose, one of caustic soda, two of carbon bisulphide, and eight of water.

From this solution the thiocarbonate may be precipitated in a pure state by addition of alcohol or strong brine, after which it may be redissolved in pure water to form a colorless solution of great viscosity. Thus, a four per cent solution is as thick as treacle, while a bottle filled with one containing eleven per cent of the thiocarbonate may be inverted for a considerable time without any risk of loss. But its most important property is its power of coagulation, which occurs spontaneously on standing for a considerable period, or immediately on heating above 60°, or by addition of an acid. This coagulation is due to the cellulose separating out in the pure state, forming a gelatinous mass which gradually shrinks, but in such a manner as to form an exact miniature of the interior shape of the containing vessel; all the sulphur and alkali are found in the liquid which separates from the shrunken mass. The cellulose thus reproduced varies in consistency according to the concentration of the original solution, but is always perfectly homogeneous; thus, it may be obtained in a form closely resembling the softer varieties of India rubber, or in one practically indistinguishable from horn, and it is not merely in appearance that this latter resembles horn but also in its consistency, for it is hard and tough and perfectly adapted for turning. Finally, it is found to possess the same increased affinity for dyestuffs that is exhibited by the original "mercerized" cotton.

The importance of the discovery is manifest, especially in view of the inevitably failing supplies of ivory, which have already resulted in the success of the ebonite and celluloid manufactures, over which it is clear that this preparation possesses many and great advantages; for none of the materials required in its production are expensive, and it is free both from the brittleness of ebonite and the inflammability of celluloid, while the readiness with which it can be obtained in any desired shape gives it a still more marked superiority over either of these products.—Knowledge.

Improved Car Doors Wanted.

Let any practical mechanic, or any practical railroad superintendent, go through any large yard where cars of all railroads are stored, and examine the doors on freight cars, and he will find that with a monkey wrench in his hand he can enter nine-tenths of the cars inside of five minutes, without breaking a seal. This because the fastenings are put on with lag screws, or ordinary bolts with the nuts on the outside of the car. There is no one road that is more subject to criticism in this respect than another, except that a few have apparently realized that this is all wrong, and made a few feeble and unmechanical attempts to better it, with very little real success.

The car manufacturing companies come in for a share of the blame for this state of affairs. They are fully aware that box cars are built for the purpose of carrying the most valuable articles of commerce; that such valuable traffic is frequently carried from the Atlantic to the Pacific coast, and is delayed and set out in large city yards, or at desert stations, unprotected, where it is subject to pilferage by being opened by thieves, who are pleased to find so easy a task as is presented by the present general construction. Knowing these facts, the car manufacturer should give intelligent consideration to the same in building a car in such a manner that the interests of his customer will be the best subserved. It will hardly be taken as a sufficient answer that manufacturers build to specifications made by the purchaser. This is not true in each mechanical detail. —J. J. Frey, Railway Review.

The Proposed Ship Canal Between Chesapeake Bay and the Delaware River.

The board to select the route of the Chesapeake and Delaware Ship Canal has been appointed by the President as follows: Thomas L. Casey, chief of engineers of the army; Captain George Dewey, United States navy; Colonel W. P. Craighill, in charge of river and harbor works in Maryland and Virginia; member of the Lighthouse Board; Mr. Mendes Cohen, of Baltimore, late president of the American Society of Civil Engineers, and J. Alexander Porter, of Savannah, Ga.

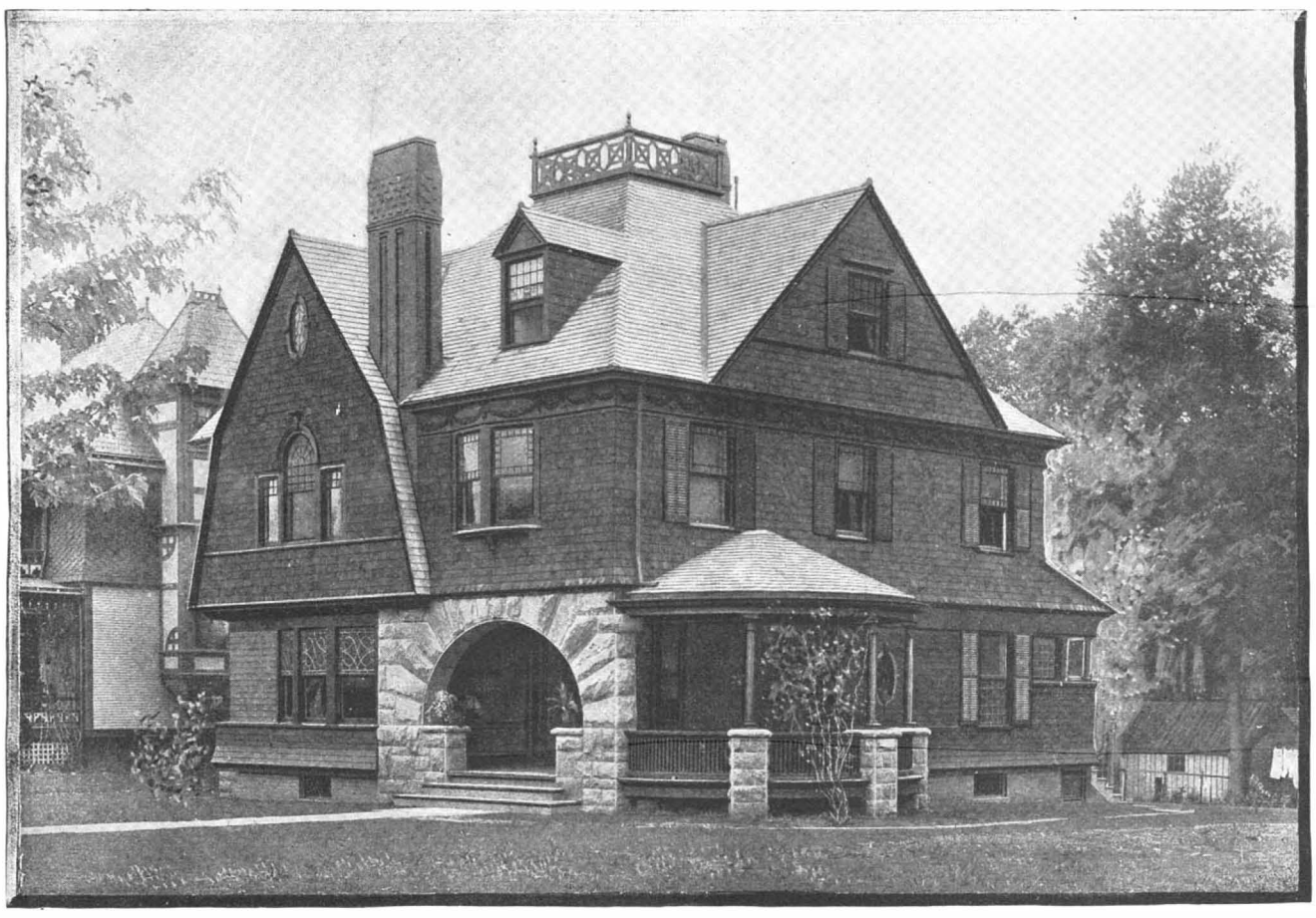
The board is instructed to examine and determine from the surveys heretofore made under the War Department the most feasible route for the construction of the waterway to connect Chesapeake Bay and Delaware River, which, in its judgment, shall give the greatest facility to commerce and will be best adapted for national defense. An appropriation of $5,000 has been made to pay the necessary expenses of the investigation. The report of the board must be completed in the next four months, as it is to be submitted to Congress at its next session.

A COTTAGE AT CRANFORD, NEW JERSEY.

Our illustration is of a cottage recently completed for Mrs. D. H. Morrison, at Cranford, N. J. The design is a mixture of Queen Anne and Colonial architecture. It has many pleasing features. The underpinning is built of pressed brick laid in red mortar. The stonework and arch to front piazza are built of rock-faced red sandstone. The first story is clapboarded and painted olive green, with bottle green trimmings; second and third stories are shingled and stained oak color. Roof shingled and left to weather finish. Dimensions: Front, 35 ft.; side, 39 ft. 6 in., not including piazza and bay windows. Height of ceilings: Cellar, 8 ft.; first story, 9 ft. 6 in.; second, 9 ft.; third, 8 ft. 6 in. The several rooms, communicating as they do, make a most attractive vista of the entire floor. The hall is trimmed with ash, and the other apartments with whitewood. The broad, low, ornamental staircase and paneled divan are the features of the hall, while the old casement window with seat and antique mantel make the dining room in keeping, and the several spindle transoms and leaded windows carry out the antique effect so successfully sought. The parlor is treated in ivory white and gilt, and it contains an open fireplace built of brick, with tiled hearth and facings, and a Colonial mantel, with columns, etc. Dining room is stained and finished in cherry. The butler's pantry and store pantry are of sufficient size to contain the usual fixtures, drawers, shelves, cupboards, etc. Kitchen is wainscoted, and all the woodwork is finished natural. It contains all the improvements. There are four bedrooms, large closets and bathroom on second floor, and three bedrooms and storage on third. Bathroom is wainscoted and furnished replete. Cemented cellar contains furnace and other necessary apartments. Cost $5,000, complete. F. W. Beall, architect, New York.

Our engraving was made direct from a photograph of the building, taken specially for the Architects and Builders Edition of the SCIENTIFIC AMERICAN.

Other exterior views, also plan of the interior of the house, are shown in the issue from which this view is taken.



A COTTAGE AT CRANFORD, N. J.

Mecca as it Is.

The Architect and Builder describes the present condition of this ancient city:

The streets of Mecca are regular, handsome, paved, and level. The houses are built of stone in the Persian and Indian style, with highly ornamented fronts, and are four or five stories high.

Every one is aware that the Holy of Holies at Mecca is the mosque or temple called the Kaaba. It was built of stone brought from the mountains which surround the town. It is twelve meters long, ten broad, and fifteen high. Of its origin nothing is known. According to Mussulman legends the first Kaaba was constructed in heaven two thousand years before the creation of the world. As to the Kaaba of Mecca, it dates from Adam, who built it immediately below the celestial Kaaba. In the course of ages it has been sometimes reconstructed and restored. It is thought that the last restoration dates from the sixteenth century. The doors of the Kaaba are covered with plates of silver and gold. In the interior are treasures which are gifts of the faithful. The floor is flagged with marble. The building is lighted by lusters and candelabra of great value. The whole temple is covered by a housing of enormous dimensions. This housing, which is called Kiswah, is of black brocade bordered with a gold band. Every year regularly a new Kiswah is sent from Egypt. In the interior of the mosque is the sacred spring called Zemzem, to which curative powers are attributed.

At the eastern angle of the Kaaba, five feet above the ground, is the Black Stone fastened in the wall and surrounded with a silver ring. Its visible face is about twenty-five centimeters in diameter. A round hollow in its center is probably the result of the numerous kisses of the faithful. It is not possible that fire has turned this stone black from being white, as it is pretended it was originally. This idea has its origin in one of those legends with which the Mussulmans have adorned their religion, and according to which it is said that the stone was once whiter than milk. The Spaniard Badia, or Ali Bey, considered the stone a piece of volcanic basalt, Burckhardt a piece of lava, and Burton an aerolite, which the Arabs saw fall and considered a sacred thing. There are at Mecca several black stones of this kind, all regarded with veneration. In going through what is called the Street of Stones two of these black stones are seen fastened in walls. One of these has the form of a cylinder; the other is flat with a hollow of half-spherical form, which, it is pretended, is the print of the elbow of Mahomet. In the houses in which Fatima, Ali, and Mahomet were born the devout visitor embraces like stones, slightly hollowed in the middle. These are the most venerated fetishes of the ancient Arab paganism. Upon the Aboukoubes, the sacred mountain which rises on the east of Mecca, is found a rocky formation of the same kind, and the Arabs pretend that the celebrated Black Stone of the Kaaba came from this place. An Arab legend confirms this statement.

Ball Bearings for Wagons.

Ball bearings are successful only when the balls themselves are of the highest quality, and the shells and axles are of the best steel, hardened and ground to the highest perfection, writes Prof. Sweet in the Rural New Yorker. The limit of error in the best does not vary more than one-quarter of one-thousandth of an inch, or one-fourth the thickness of tissue paper. Such perfection is very costly, and the least dirt destroys the whole gain, for if the balls be stopped by any impediment, they are very soon ruined. Such accurate work is not likely to be properly protected or properly cared for in farm vehicles. Hence it is questionable whether the failures would not more than overbalance the advantages; besides, in the cost of drawing a load, a part is friction and a part is overcoming the ground resistance. The poorer the road, the greater is the ground resistance, and this has a great bearing on the percentage of advantage; for supposing that, in the case of a trotting sulky, the friction is half the resistance and the ground resistance the other half, now, if we reduce the friction one half, the power required to draw the sulky would be reduced one-quarter or 25 per cent; whereas if, in drawing a lumber wagon, the friction is 10 per cent and the ground resistance 90 per cent—which on a farm and farm roads is about what it amounts to—then, by reducing the friction one-half, we have reduced the actual power required only 5 per cent. The time has not come when it will pay. It will be an infinitely better investment to use the same money to put wide tires on the wheels and cut off the forward axles so as to bring the forward wheels the width of the tires nearer together than the hind ones. I have just been over a dirt road where one hundred tons of limestone are drawn every day, and the ruts were horrible when only common wagons were used. The road is now splendid, all owing to the use of half the number of wagons built as above described, while the ball bearings could at the best reduce the power required to draw farm wagons only from 5 to 10 per cent. The wide tires and short axle wagons would reduce the cost of hauling on the farm roads 40 to 50 per cent, and the cost of the changing to ball bearings would equal the cost of the new wheels and front or back axles.

The Time of Mental Acts.

Let a dozen or twenty persons take hold of hands in a ring; each is to press the hand of his right hand neighbor as soon as he receives a pressure from the left. One person starts the pressure going, and at the same instant observes the position of the second hand of a watch. The pressure passes all around the circle; and when it arrives at the originator he notes how many seconds were required for the given number of persons in succession to receive an impression and make up their minds to act in response. The total time is then divided by the number of persons. This is a crude illustration of the reaction time which we measure with great accuracy on single persons.

As the mental portion of the reaction time becomes more complicated, the time becomes longer. For example, the processes of mental discrimination and choice require times of their own. The way we get at these "higher" mental processes can be illustrated in a simple way: A person placed in a quiet room is to tap a telegraph key every time he sees a red light, which can be produced at the will of the experimenter in the recording room. The interval of time between the actual appearance of the light and the moment the key is tapped is accurately measured. For a while nothing but the red light is used; this to obtain the simple reaction time. Then red and yellow lights are turned on in irregular succession. The person has now to discriminate between two colors and to choose between action and non-action. The increase of time required over the simple reaction time gives the discrimination time for two colors. In another set of experiments three colors are used; then four colors. As the discrimination and choice become more complicated, more time is required.

The importance of rapid and accurate reaction and discrimination is evident. Astronomers have difficulty in recording the moment at which a star passes a line in the telescope. The sportsman must pull the trigger at just the proper moment. The football player, the fencer, and the boxer are trained in rapidity of discrimination and reaction. It is very evident that a player or a pugilist who takes a long time for discrimination, choice, and volition will give a decided advantage to a quick opponent.—The Forum.

Military Brutality.

The German army has long been notorious for the brutal manner in which the private soldiers were treated by the non-commissioned and other officers. The system was inaugurated by the Great Frederick, and the military authorities since his day seemed unwilling to allow it to die out. Happily the present Emperor seems determined to have none of it. His imperial rescript on the subject forbidding any officer to strike his men made some sensation when it was issued, though it was commonly said in army circles that it would soon be a dead letter. A few recent cases proves the contrary. A well-known officer was recently dismissed the service with ignominy for the offense of striking a man in the ranks, the Emperor personally indorsing the order for his dismissal with a severe and cutting remark. Last week at Breslau a sergeant who was charged with ill-treating a soldier was tried for the offense by a council of war, was sentenced to two years' imprisonment in a fortress, and when his sentence has expired to rejoin his regiment as a soldier of the second class.

SIR JOHN LUBBOCK in his recent opening address to the Congress of the International Institute of Sociology, Paris, said that in Great Britain, one third of the taxation goes to pay for the wars of the past, one-third in preparing for wars of the future, and only one-third remains for the needs of the country itself.

A Year of Record Breaking.

This year will be memorable in the annals of athletics, sports, and physical achievements generally for the raising of the old standards of performance. When the trotting season began Nancy Hanks' record of 2:04 had stood unbeaten for a long time. Alix has brought it down to 2:03¾. On the pacing track Robert J. has lowered the record to 2:01½, beating Mascot's previously fastest mile by 2½ seconds. Directum has made a new record for two year olds by pacing a mile in 2:07¾. Fantasy has made a new trotting record for four year olds by covering a mile in 2:07¼. The wonderful performance of Flying Jib at Chillicothe, Ohio, September 29, when, hitched to a running mate, he paced a mile in 1:59½, is the crowning track feat of the season. This feat is made still more astonishing by the fact that the last half mile was paced in 58½ seconds. The best previous pacing record made by a horse hitched to a running mate was that of Westmont, who, in 1884, at Chicago, covered a mile in 2:01¾. Robert J. still holds the pacing record, but Flying Jib's work has made it probable that in the near future a mile in two minutes or less will be paced by a horse running without a mate. Nearly all the old mile turf records have been broken this season, and we must not forget in this brief review that Ducat, at Sheepshead Bay, on August 28 last, ran a mile in 1:39, carrying 113 pounds —the best one mile time ever made on a circular track.

Passing from fast horses to swift men on wheels, we find nearly all the previous bicycle records have been surpassed in 1894, and probably the next month will break them still more. J. S. Johnson has made a half mile spin against time in 54 seconds. One mile has been flown over by J. P. Bliss in a fraction over 1:52. With standing starts N. Butler has cycled two miles in 4:04 4-5; while J. S. Johnson has spun three miles in 6:26 3-5, four miles in 8:38 4-5, and five miles in 10:48 4-5. E. C. Bald has made a mile in competition in 2:05 4-5. F. J. Titus has covered 26 miles and 1,489 yards in one hour, spinning against time. And the best previous twelve hour competitive race time has been beaten by Walters, in London, who made the astonishing run of 258 miles in that time, or 21½ miles an hour.

Many other new athletic world's records have been made within the past month. The best world's running time for 300 yards has been lowered to 31 3-5 seconds. The farthest throw of a 56 pound weight has been increased to 35 feet 10 inches. The best time of a 120 yard hurdle race has been lowered from 15¾ seconds to 15 3-5 seconds.

The fastest time for swimming 100 yards was 1 minute and 12 seconds until September 15 last, when it was reduced to a fraction below 1 minute and 9 seconds. A new swimming record for 880 yards has also been made for the world; the old one was 6 3-5 seconds slower.

The greyhounds of the sea, as the Atlantic steamers are not unfitly called, have also been contributing to the record breaking of this phenomenally fast season. The Cunarder Lucania made her last passage from Queenstown to New York, or, to speak more exactly, from Daunt's Rock to Sandy Hook—2,782 miles—in 5 days 7 hours and 48 minutes, or at an hourly average speed of 21·77 knots. This beats the best previous record, which was also made by the Lucania—5 days 8 hours and 49 minutes. This ocean racer now holds the best records for the eastward as well as the westward run, her eastward time being 5 days 8 hours 38 minutes. The American liner New York has broken the best previous record of time between Southampton and New York, which she has steamed, over a course of 3,030 miles, in 6 days 7 hours and 14 minutes. The best run to Southampton from New York is still that made by the Hamburg-American liner Fuerst-Bismarck, which made it in 6 days 11 hours 44 minutes.

Truly we live in a rapid age, and if we have not yet reached "the pace that kills," it seems likely that the extreme limit alike of human energy and endurance and of the power of machinery and steam is in sight. As we see from these records, the carefully bred and trained horse can pace a mile in less than two minutes, and yet the trained man on his steel horse can beat him by nearly eight seconds. Neither animal nor human flesh and blood can be expected to go much farther in the way of overcoming the obstacles of space and distance and enlarging the possibilities of time. It is no longer a debatable question whether in physical powers the best men of this age excel the best men of ancient times. There is no well-authenticated record of a Grecian athletic feat that has not been beaten by the athletes of this nineteenth century. Leander's swim across the Hellespont was far outdone when the late Captain Webb swam across the Straits of Dover from England to France. Lord Byron had already equaled Leander's feat. The Spartan runner Ladas dropped dead on completing a race of 2¾ miles, and it was thought to be not surprising that he should, as the distance was regarded as very long. We have no record of the speed at which Ladas ran, but as to the distance covered it was trifling as compared with the distances that many of our running athletes cover.

That the modern man is of a bigger breed scientific inquiry has made certain. The size of the heroes of classic days, like most other things about them, was mythical. It was only in statuary that Ajax and the other large-limbed men of antiquity ever had existence. Many years ago an old-fashioned tournament was projected in England, and the corselets and greaves of the mailed men of the Plantagenet period were pulled out of the closets of the old castles to be used by the modern descendants of the "brave knights of old." It was at once discovered that the nineteenth century Englishman was much too tall in stature and large in girth to get into them. And thereby perished the long-cherished fiction that the human race was physically degenerating, and that the men of to-day were "not the men their forefathers were." We may, as we look over all that has been done on land and sea in lowering the racing records, alike of men, horses, and ships, feel that we are indeed "the heirs of all the ages in the foremost files of time." We have faster runners, stouter swimmers, surer marksmen, better rowers and yachtsmen, finer horsemen than ever were known to the Europe of feudal times or the Athens of Homeric days.—Baltimore Sun.

The German Beet Sugar Industry.

Speaking of this industry, Consul-General Dundas says German sugar is made entirely from beetroots cultivated by farmers who have an interest in sugar factories. The average yield of sugar in the beet is from 14 to 15 per cent, and in order to secure a good yield the roots destined for culture are selected solely with regard to the percentage of their yield of sugar. Therefore the excellence of the root in regard to yield and the production of the seed is a matter of the first importance. The plant most in demand is the little Wanzleben. The factories consume 200 tons to 1,000 tons of beetroot daily, according to size or working capabilities. The process is as follows: The roots cut into strips are edulcorated with warm water, and juice thus obtained is clarified by means of lime. The residue left is then subjected to a process by which all moisture is extracted by means of presses and utilized as provender, which has been found very serviceable. A second and third purification with carbonic and sulphurous acids follow; and the sirup and crystallization operations by evaporation and boiling give the final production of the manufactured article, which is separated by centrifugal machinery from the sirup. The deposit left from this process is the molasses which is so much used in the manufacture of spirit. The number of factories in Germany in 1891 was 406, equipped with 4,717 steam engines of 68,691 horse power, using up 10,623,319 tons of beets, and yielding 24,273,784 cwt. of sugar and 4,815,922 cwt. of molasses.

RECENTLY PATENTED INVENTIONS.

Engineering.

BOILER.—Harry H. Kelley, Elyria, Ohio. This boiler is designed to generate steam quickly, and be very economical of fuel. It is vertical, having a central sectional column or shell, and on its outside are spiral water circulating pipes having their ends connected with the shell. The shell is preferably made in four sections, connected with each other by joints, each having a ring forming a seat for metallic gaskets, and the heads of the upper and lowermost sections are connected with each other by stay bolts. The shell is supported at its lower end by water legs supported by the brickwork.

Railway Appliances.

SWITCH.—Ephraim H. B. Knowlton, West Superior, Wis. According to this improvement the switch is set by hand to side track a train, but the train in passing automatically resets the switch to close the main line again, so that the latter never can be left open by the neglect of the switchman. The operating bar is moved by a weighted lever, the bar and lever being locked by a detent, and a depressible bar and tilting frame are arranged to be operated by the wheels of the train to trip or dislodge the detent.

Electrical.

BATTERY.—Milton E. Smith and Maurice F. Geer, Rochester, N. Y. This battery comprises a jar in which is set a porous cup containing the positive electrode, preferably zinc, the exciting fluid being chromic acid and sulphate of zinc, while outside the porous cup a negative or carbon electrode extends into a solution of sulphuric acid and water, or other suitable fluid. The exciting agent may be used in liquid or solid form, and in general work the proportions preferred are nine parts of chromic acid to one part of sulphate of zinc. It is designed that a high electromotive force shall be obtained with a comparatively moderate destructive action on the elements.

ELECTRIC HEATER.—Jesse R. Davis, Parkersburg, West Va. This improvement is applicable to all classes of furnaces or stoves, and converts the current into sensible heat without the use of wire coils. The heating medium forming the walls of the stove or furnace, and made hot by the passage of the current, is composed of finely comminuted carbon mixed in varying proportions with an inert refractory non-combustible material, also a non-conductor, as slaked lime, magnesia, silica, asbestos, etc., so that when the current is passed through the mixture the mass is rendered partly conductive by its carbon particles, but is of high resistance from the preponderance of non-conducting substances. By regulating the proportion of carbon to the inert material, the proportion of heat developed may be adapted to various uses.

CONDUIT ELECTRIC RAILWAY.—James E. Toole, Northumberland, Pa. This inventor has designed a strong and comparatively inexpensive conduit, in which the trolley is so hung that it will pass easily around curves, the trolley wheel being guided on the line wire, and means being provided for conveniently raising the trolley to break the circuit. The construction of the trolley is such, also, that the insulation will be perfect, and there will be no danger of grounding the circuit.

PRODUCING OZONE.—John T. Donovan and Henry L. Gardner, Springfield, Mass. For the production of ozone in large quantities these inventors have devised a process to work in connection with currents from electric light wires, employing electrolytic apparatus with communicating chambers in which are inserted positive and negative electrodes connected with the electric generator. There are connections for removing the hydrogen liberated from the negative electrode, while the ozone generated at the positive electrode escapes into the surrounding air or may be conveyed away in a tube.

Mechanical.

CABLE SUPPORT.—Erik G. P. Wern, Brooklyn, N. Y. This invention relates to supports for cables propelling cars to carry buckets of coal, etc., and arranged to swing out of normal position when struck by a device coupled to the moving cable, returning to former position automatically after the device has passed. The arm supporting the cable swings on a fixed pivot, springs connected with the arm being compressed when the arm is swung out of position in either direction, and the springs returning the arm to its normal position.

CHAIN HOD ELEVATOR.—Gustaf P. Wern, Brooklyn, N. Y. This inventor provides improvements whereby the driving shafts are securely held in proper position to prevent undue friction and binding in the bearings. Fixed blocks are attached to the standards of a strongly constructed frame and bearing boxes with curved exterior surfaces are seated in the fixed blocks, while a shaft is journaled in the bearing boxes and adjustable blocks engage with their concave under surfaces the bearing boxes opposite the fixed blocks. The adjustable blocks screw on pivoted screw rods carried by blocks fixed in the standards.

ELEVATOR PLATFORM.—This is another patented invention of the same inventor, for a simple and durable construction more especially designed for use in elevators carrying wheelbarrows, hods and other vehicles and articles, or which, being very safe and strong, may also be used to carry passengers. Spaced metallic plates are located at the sides of the platform, posts between the plates, and bolts pass through the plates, posts and platform, while shafts with reduced ends are journaled in the plates, safety clutches being secured on the outer ends of the shafts, and means provided for actuating the clutches.

VARIABLE GEAR FOR SAW MILLS.—Jacob T. Oberdorfer, Delmount, Ohio. Beneath a vertically movable shaft carrying a friction disk is a countershaft on which is a sliding pulley engaging the disk, while an oscillating horizontal shaft carries a notched quadrant with which a lever fulcrumed on the shaft may be held in engagement. There is an operative connection between the lever and pulley, to slide the latter, and a lever to lift the vertical shaft, the lever riding on a crank on the oscillating shaft. The mechanism is cheap, strong and simple, and by a single lever the saw mill carriage may be driven in either direction, its speed perfectly controlled, or the apparatus be thrown out of gear.

WOOD BENDING MACHINE.—John Dawson, Brooklyn, N. Y. This is a machine more especially designed for quickly bending chair backs, and in it a large number of the backs may be simultaneously undergoing treatment, with very little labor and a high degree of economy. It has a steam box adapted to be rotated, and with a series of seats and clamps for each seat, a carriage traveling above the box having lever devices to be moved against the clamps. The machine, besides taking in a large number of articles at one time, effects the bending in an hour's time, as against twenty-four hours formerly required for the same work.

Miscellaneous.

REEFING SAILS.—Samuel G. Martin, Branchport, N. J. This inventor has devised a fore-and-aft sail which may be readily converted into a storm trysail and quickly restored to its original shape. The sail may be conveniently reefed, then folding regularly on the boom until the reef points are fastened, and when the reef tackle is manipulated the mast hoops are hauled down simultaneously and evenly with the furling of the sail cloth, dispensing with the services of an attendant at the hoops. An auxiliary leech rope is located above the reef points, that when the sail is reefed to its utmost it will draw from the auxiliary leech, a second auxiliary leech forming the upper leech of the trysail.

OIL CAN CARRIER.—Jurgen H. Lins, Brooklyn, N. Y. This carrier is designed for use on grocers' wagons and other vehicles, to facilitate the delivery of oil to customers without danger of spilling the oil over groceries or other goods. The invention consists of a box to be fastened to the under side of the wagon body, and having a downwardly swinging door, there being in the box a number of compartments, each adapted to receive and hold a can, and a drip aperture through which any oil that leaks will pass to the ground.

VEHICLE BRAKE SHOE.—Henry F. Shephard, New York City. This shoe is designed to follow the curvature of the wheel, affording a full bearing from one end of the shoe to the other, whether the wagon be loaded or unloaded. A barrel is connected with the shoe, and a carrying shaft provided with a spindle is loosely passed through the barrel, a spring encircling the spindle and being compressed within the barrel, whereby the latter is maintained in any position in which it may be placed.

CARRIAGE TOP WORKER.—August C. Bendler, Milwaukee, Wis., and William E. Bendler, Chicago, Ill. A two-part crank shaft on the carriage top has a handle forming the coupling which connects the two sections of the shaft, and there is an operative connection between the cranks of the shaft and the braces of the carriage top, forming an extremely simple and strong device, readily applied to any carriage top, enabling it to be conveniently worked from within the carriage.

KNOCKDOWN BARREL.—Hartley Ellis, East Liverpool, Ohio. This inventor provides a package specially designed for shipping crockery and glassware, the empty package being readily taken apart and packed for return shipment. It has an interior middle and exterior end hoops, bolts connecting the end hoops with the middle hoop, by which the barrel-like bulging of the staves is effected, the middle hoop holding the staves out and bracing them firmly.

WORKMAN'S TIME RECORDER.—Edward G. Watkins, Gardner, Mass. This is a very simple and cheap machine, to be operated by the individual employes when they begin and leave off work, keeping an accurate record of each one's time on a sheet which may be detached and filed away for future reference. No ink is employed, and there are no parts which require constant care and frequent renewal, nor is it necessary to transfer the record before the pay roll can be made out, the figures for a whole department being made up in total on the same sheet.

DRAWING INSTRUMENT.—George Thomas, Jersey City, N. J. This is an improvement in compasses or other instruments having a jointed laterally extended arm carrying a tracing device or socket for holding a tracing point. The tracing arm of the instrument has a lateral screw-threaded post at its outer end, and a detachable point or arm to carry a tracing device with a head having a lateral slot to receive the post, on which screws a nut, a sleeve being interposed between the arm and nut. The range of the instrument may be increased or decreased as desired in a quick and simple manner.

LINER AND MEASURE.—Sannosuke Katani, Belmont, Cal. A cord-carrying spool is held in a suitable casing, having a pawl and ratchet for locking the spool, and in the casing is an inking well, while a sliding rod, with one end resting on the pawl, is provided with a guide for forcing the cord into the ink well. It is a simple device, readily carried about, by which a straight line may be easily marked, the length of cord withdrawn being accurately shown by an indicator upon a circular dial.

TOBACCO OR CIGAR MOISTENER.—Jay A. Robinson, Denver, Col. This device comprises a water tray upon the bottom of which rest a number of hollow porous blocks having open bottoms, the tray being placed in show cases to moisten the air more effectually than is accomplished by the sponges usually employed.

CASTRATING INSTRUMENT.—John E. Anderson, Carbon, Wyoming. For the quick and safe cas-

tration of young domestic animals, more especially lambs, this inventor has devised an instrument with curved spring jaws connected with shear-like blades, the jaws meeting only after the blades have made their complete cut.

DESIGN FOR A BELT POCKET.—Richard S. Porro, New York City. This design has a shield-like portion near the top of which is a spring tongue, while below it is a circular figure on the front of the shield.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention and date of this paper.

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References to former articles or answers should give date of paper and page or number of question.

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Minerals sent for examination should be distinctly marked or labeled.

(6271) A. E. E., Brunswick, Ga., writes: Inclosed find a sample of a substance which fell from the sky, and which I am told is called "balloon spider's web." It fell in great abundance at four o'clock in the afternoon of September 20, 1892, at Gainsville, Fla., coming form a westerly direction after a series of light showers. I have shown the substance to a number of people in two or three of the Southern States, and while it excited considerable curiosity, no one was able to give me any information concerning it. I am told that the same thing has occurred in Russia and other parts of Europe. Will you kindly enlighten me on this subject or give me the technical name of the same, that I may inform myself? A. The substance received was a white silky fibrous material, very soft to the touch. Dr. L. O. Howard, Entomologist, Department of Agriculture, to whom were ferred the matter, says: The substance is, in all probability, spider silk. The falling of this silk in such abundance in the vicinity of Gainsville, Fla., in the third week of September, 1892, attracted considerable attention at the time, and samples were received at the department from several residents of Gainsville and Arredondo. The matter was carefully investigated by Dr. George Marx, the well known authority on spiders, who in a communication read before the Entomological Society of Washington November 3, 1892, published in Volume II. of the Proceedings, pp. 385-8, gave it as his conclusion that the substance was composed of the matted together webs or threads of gossamer spiders, which sail through the air in such numbers in the sunny days of early autumn. Careful chemical and microscopical examinations confirmed this theory.

(6272) W. C. V., Iowa, writes: Is there an observatory in United States whose latitude and longitude is so accurately known, and whose clock has the time sufficiently correct, and whose telescope is mounted with such accuracy in all its circles and bearings, that the telescope can be set at an altitude and azimuth according to astronomical computations, so that the planet Jupiter will appear in the field at the tick of the clock? Are there computations 200 years old or more, that are sufficiently correct to enable the performing of the above feat? A. Yes; every well regulated working observatory in the United States and other countries can set its transit for a computed entrance of a star or planet into the field. Many of the best equipped observatories can also set their equatorially mounted telescopes to cover the position of celestial objects within their field. Accurate observations have been made on the positions of celestial objects for the past 150 years, which with the present observation have well established the position and perturbation of all the members of the solar system and the position and changes for many thousands of the starry host.

(6273) E. A. T. asks: 1. What is the voltage of motor 641 wound for dynamo with No. 20 wire? A. We have no record of the factors, and do not recommend the motor as a dynamo. 2. Will small plating dynamo described in SUPPLEMENT, No. 720, give trouble by heating? A. No. 3. Are toothed washer armatures better than plain washers? A. Each has its own good points; one cannot be pronounced better than the other.

(6274) E. H. writes: 1. I have a small Wimshurst influence electric machine and am much troubled with the plates breaking. They start in the middle and the crack extends until the plate comes in half. They are cemented on to wheels in the center of the plate. Can I stop it in any way, and if not is there any other cheap substance that I could use instead of glass. Would hard rubber do? The plates are ten inches across. A. Possibly the crack is started in your plates by the heat used in cementing. They should not act as you describe. Ebonite will answer instead of glass. 2. Could you tell me of any paint that would do to cover the glass in making Leyden jars instead of tin foil? A. No. Metallic bronze powder might answer, but would be very inferior if put on with varnish. 3. Could you light a small incandescent lamp, say 1, 2, or 3 candle power, with my electric machine? A. No.

(6275) A. M. F. writes: 1. If two insulated points (copper or other metal) are ½ inch apart, will a current actuated by a potential of 10,000 volts jump across. A. No. 2. If two points, insulated, are inclosed in a vacuum, and connection is made by quicksilver flowing over the two points, what action will a 10,000 volt current have on the quicksilver? Or, in other words, can quicksilver, under these conditions, be used to complete circuit? A. There is no such thing as a 10,000 volt or any other volt current. Voltage is a measure of potential, not of current. Quicksilver will conduct a current very well, although it is of rather high resistance.

(6276) N. M. B. asks: 1. In making armature for motor described in "Experimental Science," can I with advantage use a section of an iron pipe 2¼ inches internal diameter, 2 inches long, and iron ⅜ inch thick, instead of wire armature? A. No; it is inferior to wire. 2. Is there any convenient and reliable test for genuine amber? A. Hardlyany can be given; its specific gravity 1·065 to 1·081, hardness 2 to 2½, and its resistance to heat, fusing imperfectly at 550° Fah., are criteria. 3. Does the SCIENTIFIC AMERICAN SUPPLEMENT treat subjects more in detail than the SCIENTIFIC AMERICAN? A. The articles in the SUPPLEMENT are longer as a rule, and hence perhaps go more into detail. The SCIENTIFIC AMERICAN SUPPLEMENT represents the scientific life of the world in all departments better than any other publication known to us, and is an invaluable companion to the SCIENTIFIC AMERICAN.

(6277) J. N. T. asks: 1. Will No. 19 American gauge iron wire do for core of armature? A. Yes. 2. You state in body of article that No. 18 American gauge magnet wire is to be used on armature and in summary No. 16. Which is correct? A. Use No. 18 wire for the armature coils. 3. In your diagram you show that coils on field magnet are wound in shape of a pyramid. Must it be wound with one convolution less in each layer or must it be wound same as directions for armature? A. Our diagram shows the preferable way of winding the magnets. The pyramidal winding is not essential—it is convenient. 4. Can you tell me how to make a plunge battery to run the motor? A. See our SUPPLEMENT, No. 792. 5. Will a gravity battery run it? A. Not unless of very large size. We do not recommend it. 6. I have inspected a number of stove pipes made of galvanized iron, and in a number of cases I have noticed a deposit has run down the outside that has a brownish yellow cast. Can you please inform me what it is? Is it creosote from the smoke? A. We think it is largely empyreumatical matter (creosote, etc.)

(6278) G. P. McD. asks: Is there any hard non-conducting material that will stand the heat of an electric arc without burning for about 2 minutes? A. Lime, zirconia or magnesia approaches your requirements.

(6279) W. B. H.—False Scorpion on a House Fly.—The small brown A thropod, with flattened abdomen, and lengthened maxillary palpi, ending like a lobster's or scorpion's claws, and which fell from a house fly which Mr. W. B. Halsey, of Brooklyn, caught, is one of the false scorpions (Chelifer cancroides, L.) This species is often found on the legs of flies and of other insects, allowing itself thus to be transported and perhaps feeding upon the red mite, Astoma (Trombidium) muscarum, Riley, which is so frequently attached to the common house fly. The Chelifer is not uncommon about old books and in dark places, where it feeds on mites and book lice (Psocus spp.) The female carries her eggs in a little bunch under the abdomen.—C. V. R.

(6280) F. J. M. says: In what part of bivalves are pearls found? I mean whether they are situated inside of the body of the pearl oyster, or outside between the body and the shell. A. It is believed that most pearls are formed by the intrusion of some foreign substance between the mantle of the mollusk and its shell, which, becoming a source of irritation, determines the deposition of nacreous matter in concentric layers until the substance is completely encysted.—Encyclopedia Britannica.

(6281) W. D. S. asks: Is there any trouble experienced with fire hydrants from freezing? And if so, what is the cause? Is it from difficulty in getting rid of the water in the hydrant after it is shut off from below? A. When fire hydrants are properly set with a cesspool and waste for draining the hydrant when closed, there should be no trouble from freezing. If the waste hole is not provided, or gets stopped, the hydrant will remain full of water and will freeze solid in cold weather. In cold climates the valve of a hydrant should be 5 feet below the surface, with a pit sufficiently large to quickly absorb the water wasted, and from leakage of the valve.

Communications Received.

"On the Sun." By T. B. Joseph.

"Theory of the Cause of Solar and Planetary Rotations." By I. E. C.

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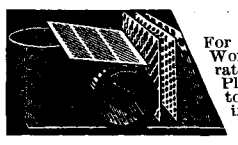

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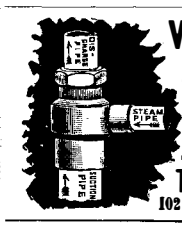

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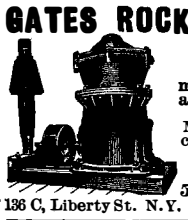

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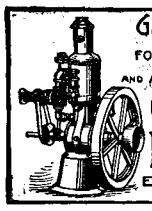

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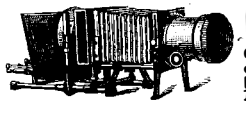

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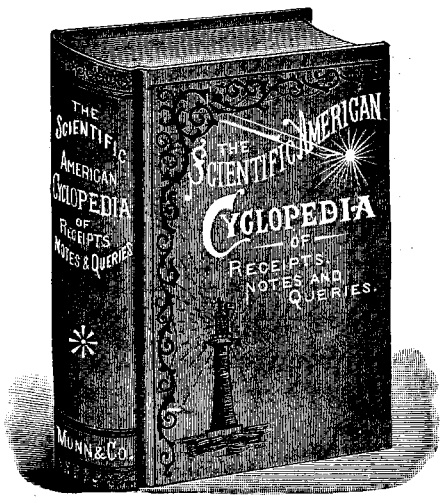

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